

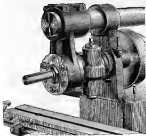
BROWN & SHARPE MFG. CO.,

Providence, R. I., U. S. A.

VERTICAL SPINDLE MILLING ATTACHMENTS

FOR

NOS. 1 & 3 UNIVERSAL AND NO. 6 PLAIN
MILLING MACHINES.



This device is used for a large range of light milling, and is of especial advantage for key-seating, die-sinking, cutting T slots, etc.

The holder or frame is secured to the overhanging arm, and the horizontal shaft is inserted in the cone spindle of the machine. The vertical spindle is driven by the horizontal shaft through spiral gears.

S. A. SMITH,

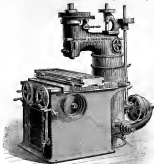
Western Representative,

23 SOUTH CANAL ST.,
CHICAGO, ILL.

BROWN & SHARPE MFG. CO.,

PROVIDENCE, R. I., U. S. A.

No. 2 VERTICAL SPINDLE MILL- ING MACHINE.



This machine, for many kinds of work, is preferable to a machine with a horizontal spindle. The operator can more clearly and easily see the work and more readily follow any irregularity in the outline of the surface to be milled.

The platen is affixed solidly to a broad and substantial base and rests upon flat and simple bearings. It is 41 inches long and 18 $\frac{1}{2}$ inches wide and is fed in either direction automatically or by hand. It has eight changes of speed for each speed of spindle.

The spindle has three belt and three gear speeds, which, with two speeds of counter, make twelve speeds in all. At its lowest position the spindle is 1 $\frac{1}{2}$ inches and at its highest 15 inches above the platen. Cutters up to 8 inches diameter may be used in surfacing.

Weight, 5,100 lbs. Floor space, 82x75 ins.

S. A. SMITH,

Western Representative,

29 So. Canal St.,

CHICAGO, ILL.

BROWN & SHARPE MFG. CO.,

PROVIDENCE, R. I., U. S. A.

No. 7. PLAIN MILLING MACHINE.

The spindle has a smooth, steady and powerful motion. The feed is automatic or by hand in either direction the entire length of the table, and can be varied or reversed without shifting the belt. It can be varied from 0 to 1-16 of an inch for each revolution of the spindle. The table is 72 in. long, 14 1-2 in. wide.

Weight of machine, 4,750 lbs.

Descriptive Circular with sectional views mailed on application.

S. A. SMITH,

Western Representative,

23 So. CANAL ST., CHICAGO, ILL.



BROWN & SHARPE MFG. CO.,

PROVIDENCE, R. I., U. S. A.

MILLING MACHINES.

MILLING CUTTERS.

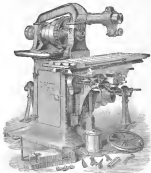
SPECIAL FORMED CUTTERS.

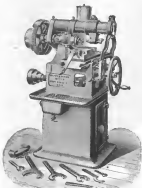
CATALOGUE MAILED ON APPLICATION.

S. A. SMITH,

Western Representative,

23 SO. CANAL ST., CHICAGO, ILL.





BROWN & SHARPE MFG. CO.,

PROVIDENCE, R. I.

No. 2 PLAIN MILLING MACHINE.

The greatest distance from the center of spindle to top of table is 6 inches; the least distance, 2 7/16 inches.

The Table is 38 inches long, 9 1/2 inches wide. The platen, to which the work is secured, is 19 inches long and six inches wide. The total length of feed, 17 1/4 inches. Weight, 1900 lbs. Floor space, 45x45 inches.

S. A. SMITH,

Western Representative,

23 So. CANAL ST.,

CHICAGO, ILL.

BROWN & SHARPE MFG. CO.,

PROVIDENCE, R. I.

IMPROVED SCREW MACHINE

For making screws, turning, boring and facing bushings, tapping and facing nuts, making washers, pins, etc.

In many instances this machine is used instead of an Engine Lathe, and effects a saving of 25% to 50% in the cost of work.

The spindle boxes are steel, hardened and ground inside and out. The spindle is also steel; its front bearing is hardened, and both bearings are ground. Diam. of hole through spindle, 21-32"; 6 holes in revolving head, 12-16" diam.; length that can be held, 39 1/2".

Illustrated Catalogue, showing full line of Screw Machines usually kept in stock, mailed on application.

S. A. SMITH,

Western Representative,

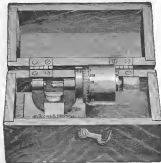
23 So. Canal St., CHICAGO, ILL.



BROWN & SHARPE MFG. CO., PROVIDENCE, R. I.

MICROMETER CALIPER No. 75. ENGLISH OR METRIC MEASURE.

Patented April 25, 1875, January 25 1896.



This Caliper is shown half size in cut and measures all sizes less than one-half inch by ten-thousandths of an inch. The measurements can be read directly from the barrel; the screw has fifty threads and the barrel is divided into two hundred equal parts.

This Caliper will be found of service to wire drawers, watchmakers and others who desire fine measurements and whose work is of such a class that a Micrometer Caliper can be used when placed on a bench.

This Caliper is also made to measure all sizes less than thirteen millimetres by hundredths of a millimetre.

- England—BICE & BICKMAN, 260 Whitechapel Road, London, E.
- Germany—SCHUBERT & SCHUTTE, 22 Spandauerstrasse Berlin, O. (Hess) Tools.
- Germany—G. DIECKMANN, Aufschersstr. 1 Berlin, W. 41.
- France—FENWICK FRERES & CO., 28 Rue Marib, Paris.
- France—F. G. KRUTSCHER, 140 Rue de Noyon, Paris (8th arr.)
- Canada, Ill.—FELP, A. BICH, 24 South Canal St.

BROWN & SHARPE MFG. CO.,

PROVIDENCE, R. I.

No. 3 Surface Grinding Machine.

For grinding punches, dies and parts of machines, cast iron or steel, either hard or soft. The entire cost of files is saved, and better surfaces are obtained at one-quarter the cost of labor usually expended in filing or stoning.

This machine will grind a piece 30 inches long, 14 inches wide, $11\frac{1}{2}$ inches high, using a 12-inch wheel.

Weight about 2500 lbs.

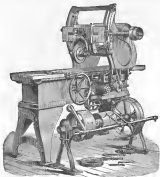
The machines and tools described in catalogue are usually kept in stock.

S. A. SMITH,

Western Representative,

23 SO. CANAL STREET,

CHICAGO, ILL.



BROWN & SHARPE MFG. CO., PROVIDENCE, R. I.

WORM HOBS With Relieved Teeth.



We are prepared, by the use of special machinery, to make Worm Hobs of any size, the teeth of which can be ground on their faces without changing their form.

By our method of relieving the Hobs they cut as freely as milling cutters.

ENGLAND—BUCK & HICKMAN, 980 Waterloo Road, London, E.

GERMANY—G. DIECKMANN, Aufbacherstr., 5 Ber
lin, W. G.

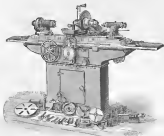
FRANCE—FENWICK FRERES & CO., 21 Rue Marial,
Paris.

FRANCE—F. G. KREUTZERBERGER, 149 Rue de
Nouvelly Puteaux (Seine).

CHICAGO, ILL.—FRED A. RICH, 28 South Canal St.

BROWN & SHARPE MFG. CO., PROVIDENCE, R. I.

VISITORS ARE WELCOME AT OUR WORKS.



No. 3 Universal Grinding Machine—Improved.

The chief characteristic of our tools, we think, is their accuracy. Especially in this respect we intend that they shall be the best of their respective classes. Cylindrical bearings are accurately ground; plain bearings are scraped to surface plates; alignments are correct.

England—WYCE & RICKMAN, 100 Tottenham Road, London E.
Germany—G. THIERMANN, Aufschneider & Berlin, W. St.
France—FRÉVILLE, FRÉRES & CO., 11 Rue Maillot, Paris.
France—E. G. KRISTENSEN, 140 Rue de Valenciennes, Paris.
Chicago, Ill.—J. B. & H. C. J. Smith (East) St., and
Wright's Exhibition Exposition, Machinery Hall
Acres, Section 13, Corner Coliseum A, 20 and 21
Coney Aisle.

BROWN & SHARPE M'F'G CO.

PROVIDENCE, R. I.

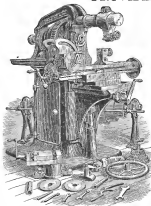
MANUFACTURERS OF THE

UNIVERSAL Milling Machine

This Machine has been designed especially to meet the wants of Steam Engines and Locomotive boilers, and others engaged in the manufacture of heavy machinery and tools.

The essential features and details are the same as in our smaller Universal Milling Machine, with such enlargement of the whole machine and its parts as would best adapt it for the class of work to be done. The cone has three diameters, each $2\frac{1}{2}$ inches face. In addition, the cone is strongly geared, thus making six changes of speed. There are, also, the same number of changes of feed. The spindle boxes are of hardened cast steel, and, together with the spindle bearings, are carefully ground, and are provided with means of compensation for wear. The spindle will carry a cutter wheel projecting 12 inches, which is supported by an adjustable center at the outer end, 4 inches of 8 inches or less diameter can be used. The horizontal movement of the spiral clamp bed upon the knee, is a line with the spindle of the machine, is 6 $\frac{1}{2}$ inches, and the vertical movement of the spiral bed centers below the spindle centers is 11 inches. The spiral bed can be set at angles of 30° each way from center line of spindle, and can be fed automatically 20 inches, taking also 22 inches between the centers, and will sawing 1 $\frac{1}{2}$ inches.

Illustrated Catalogue sent per mail on application.



BROWN & SHARPE MFG. CO.,

PROVIDENCE, R. I.

A NEW PLAIN MILLING MACHINE, No. 0.

16 in. x 4 1-4 in. x 12 in.

(The Nos. 1 and 2 Catalogue have been previously advertised.)

The table has an automatic longitudinal feed of 16", a transverse movement of 4 1/4", and can be lowered 12" from center of spindle. Weight 770 pounds.

1893 Catalogue, pages 14 and 15.

BARLON—BICE & HICKMAN, 210 Whitehall Street, London, E.
BRUSSELS—G. LEBLANC, Agent-General, 5, Rue de la Vierge, 5, 1880, W. 42.
FRANCE—FRANÇOIS FLEISS & CO., 21 Rue Martel, Paris.
FRANCE—J. B. KROUWER, 101 Rue de Valenciennes, Paris.
CHICAGO, ILL.—COPPEL & HITCH, 21 South Canal St., and World's Columbian Exposition, Machinery, Hall Annex, Section 12, Crane Column J, 47 and 48 Center Alley.



BROWN & SHARPE MFG. CO.,

PROVIDENCE, R. I.

No. 3

34 in. x 7 in. x 19 3-4 in.

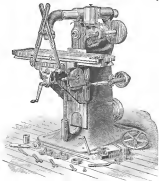
A NEW

Plain Milling Machine

The table has an automatic longitudinal feed of 32", a transverse movement of 9" and can be lowered 19 3-4" from centre of spindle.

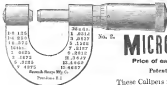
Net Weight, 2,500 lbs.

Patrons—BICE & HICKMAN, 100 West Chapel Road, Los Angeles, Ca.
Germany—SCHULZ & SCHULZ, 55 Spandauer Strasse, Berlin, E. (Kaiser) Tool Co.
Germany—G. DIECKMANN, Auf dem Markt, 1 Berlin, W. (Kaiser) Tool Co.
France—FRANCK, FRERES & Co., 2 Rue Martel, Paris.
London—T. G. CRADOCK & Co., 118 New St. Street, London, England.
Canada, Ill.—F. E. & J. H. COE, 25 No. Canal St.



BROWN & SHARPE MFG. CO.

PROVIDENCE, R. I., U. S. A.



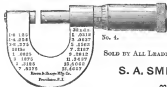
No. 2.

MICROMETER CALIPERS.

Price of each, \$4.50. In Morocco Case, \$5.00.

Patented April 22, 1878. Jan. 22, 1884.

These Calipers measure all sizes less than one-half inch by thousandths of an inch. They can be conveniently carried in the pocket. The No. 3 is suitable for measuring sheet metal, wire, etc. The No. 4 is preferred by many classes of machinists, tool makers, watch makers, etc.



No. 4.

SOLD BY ALL LEADING HARDWARE & INSTRUMENT DEALERS.

S. A. SMITH, Western Representative,

23 SO. CANAL STREET, CHICAGO, ILL.

BROWN & SHARPE MFG. CO.

PROVIDENCE, R. I.

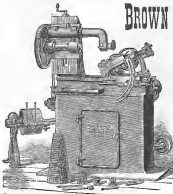
NO. 4 AUTOMATIC GEAR CUTTING MACHINE.

This machine is designed to meet the wants of machinery manufacturers or others who have large numbers of gears to cut. It is arranged for cutting both bevel and spur gears of sizes not exceeding eighteen inches in diameter, four inch face, and not coarser than six diametral pitch (about one-half inch circular pitch). It is entirely automatic.

S. A. SMITH,

Western Representative,

23 So. Canal St., Chicago, Ill.

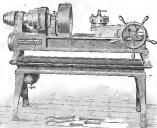


BROWN & SHARPE MFG. CO., Providence, R. I.,
U. S. A.

HORIZONTAL CHUCKING MACHINE.

Patented October 15, 1889.

Other Patents Pending.



The head is back-geared and has a patented clutch for changing from belt to back gears without stopping the spindle. The gears are underneath the spindle cone and entirely enclosed. The spindle and boxes are steel. The end thrust is taken by the rear box.

The turret is fed automatically or by hand, and, as each of the four speeds given by the feed cones may be varied by shifting the lever without changing the belt, the tools may be fed fast or slow for each belt of the cones, giving eight speeds in all. The turret is $3\frac{1}{2}$ " diameter, and has seven holes $1\frac{1}{2}$ " in diameter. Movement of the turret head slide, $2\frac{1}{2}$ ". Swing over bed, 15° . Length of bed, $60"$. Depth that can be drilled, $8"$. Weight about 1,800 lbs.

S. A. SMITH,

Western Representative,

23 So. Canal St., CHICAGO, ILL.

BROWN & SHARPE MFG. CO.,

PROVIDENCE, R. I.

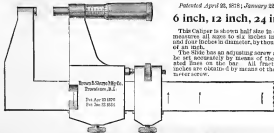
NEW MICROMETER CALIPER.

Patented April 22, 1878; January 22, 1884.

6 inch, 12 inch, 24 inch.

This Caliper is shown half size in cut and measure all sizes to six inches in length and four inches in diameter, by thousandths of an inch.

The Slide has an adjusting screw and can be set accurately by means of the graduated lines on the bar. All fractions of inches are obtained by means of the micrometer screw.



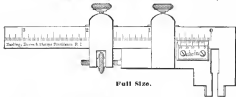
SOLE AGENTS—RICE & RICHMAN, 256 Whitehall Street, London, E.
Germany—SCHNEIDER & SHULTZ, 39 Spandauerstrasse, Berlin, G. (Small Tools)
Canada—G. MICHELANI, 44, Bechoyette, S. Berthe, W. Q.

France—FENICE PEREE & Co., 21 Rue de la Harpe, Paris.
France—F. G. KRETTENBERGER, 149 Rue de Valenciennes, Paris.
Chicago, Ill.—FRED. A. RICH, 22 South Canal St.

DARLING, BROWN & SHARPE, PROVIDENCE, R. I.

POCKET VERNIER CALIPER.

No. 680. Price, \$10.00. In Morocco Case, \$10.50.



This Pocket Vernier Caliper is graduated on the front to read, by means of a vernier, to thousandths of an inch. It is graduated on the back to 64ths of an inch. The jaws are of steel, hardened and ground, are 3-4" long, 1-4" wide when closed, and take inside as well as outside measurements. The Caliper measures

to 1 11-16" outside diameter. This Caliper is furnished graduated to millimeters in place of 64ths of an inch, with a vernier to read to 50ths of a millimeter.

London—NICE & HICKMAN, 240 Whitechapel Road, London, E.
London—CHAS. CHURCHILL & CO., Ltd., 22 Cross St., Liverpool, London, E. C.
Germany—SCHMIDT & SCHETZ, 59 Spandauerstrasse, Berlin, O. (Small Tools).
Germany—G. DIECKMANN, Maschinen- & Werkz. W. 21.

France—TECHNIQUE PRECISE & CO., 11 Rue de Valenciennes, Paris.
France—F. G. KRUPP-SCHNEIDER, 140 Rue de Valenciennes, Paris.
(Gross.)
Germany, Ltd.—FRED. A. NIPP, 25 Rue de Valenciennes, Paris.
New York City—F. G. KRUPP-SCHNEIDER, 140 Liberty St., Room 600.

BROWN & SHARPE MFG. CO.,

PROVIDENCE, R. I., U. S. A.

NO. 2 SURFACE GRINDING MACHINE.

This machine is designed for finishing true and bright surfaces for many small parts of machinery, tools and instruments; also for grinding hardened dies, etc.

The spindle runs in boxes protected from emery dust, and provided with means to compensate for wear.

The table is fed longitudinally and transversely, either automatically or by hand.

S. A. SMITH,

Western Representative,

23 So. Canal St.,

CHICAGO, ILL.



BROWN & SHARPE MFG. CO.,

PROVIDENCE, R. I., U. S. A.

INVOLUTE GEARS.

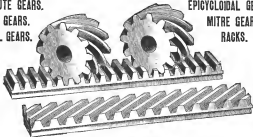
BEVEL GEARS.

SPIRAL GEARS.

EPICYCLOIDAL GEARS.

NITRE GEARS.

RACKS.



S. A. SMITH,

Western Representative,

23 SO. CANAL STREET,

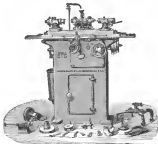
CHICAGO, ILL.

BROWN & SHARPE MFG. CO.,

PROVIDENCE, R. I.

No. 1 UNIVERSAL GRINDING MACHINE.

Patented Feb. 27, 1877; Aug. 12, 1890.



The machine shown in cut has been substituted for the No. 1 Universal Grinding Machine previously manufactured.

The head stock can be set at any angle within the whole circle, and the wheel may be set at any angle from 0 to 90 degrees relative to the wheel bed. The cross-feed hand wheel is graduated to read to thousandths of an inch in the diameter of the work. Work 8" diameter and 20" long received between centers.

Weight, 2,000 lbs.

Weight of previous machine, 1,800 lbs.

S. A. SMITH,

Western Representative,

23 So. CANAL ST., CHICAGO, ILL.

BROWN & SHARPE MFG. CO.,

PROVIDENCE, R. I.



STANDARD REFERENCE DISKS,

for use in setting Calipers, testing measuring tools, and reference for sizes in shop practice. They are made of steel, hardened and accurately ground to size.

Price of complete set (45 disks and six handles), \$35.00.

Single disks, from 90 cts. to \$1.50.

Single handles, from 45 to 60 cts.

PRICE LIST MAILED ON APPLICATION.

S. A. SMITH, Western Rep.,

23 So. CANAL STREET,

CHICAGO, ILL.

BROWN & SHARPE MFG. CO.,

PROVIDENCE, R. I.

CAST IRON STRAIGHT EDGES.



18 in. x 1 1-2 in.	7 lbs.	\$7.00.
24 in. x 1 5-8 in.	10 "	9.50.
30 in. x 1 3-4 in.	16 "	12.00.
36 in. x 1 7-8 in.	19 "	15.00.
48 in. x 2 in.	36 "	20.50.
60 in. x 2 1-8 in.	51 "	26.50.
72 in. x 2 1-4 in.	76 "	33.00.
96 in. x 2 1-2 in.	153 "	39.00.
120 in. x 2 5-16 in.	175 "	45.00.

S. A. SMITH,

Western Representative,

23 So. Canal Street,

CHICAGO, ILLS.

BROWN & SHARPE MFG. CO.,

Providence, R. I., Manufacturers of

MACHINERY AND TOOLS.

Description of No. 2 Vertical Chucking Machine.

Patented August 4th, 1886.

With this Machine, from two to four times as much work can be accomplished in a given time as can be done upon an Engine Lathe, and at a much superior margin, the work being more easily traced and fastened in place than upon any machine having a horizontal spindle, and the different beds in the turret-head easily brought into operation in succession, while from the perpendicular position of the same, the chips fall through the center of diameter of revolving table to the floor, causing no trouble by clearing of castings, &c.

It has the Capacity to take a pulley 38 in. diam., 188 in. face, and hub of 18 in. in length, and to bore a 5-in. hole in same, making two or three cuts, and finish by reaming, without removing the tools or work.

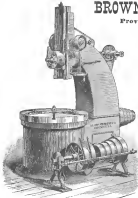
The Revolving Table is driven by a 3-step cone for 1-in. belt, and geared to 1. Range of cone so geared as to make cutting speed uniform for 3 different diameters of holes.

The Turret has 4 holes 1 3/4 in. in diameter, and is accurately clamped in position. An adjustable dog allows the locking pin to be withdrawn at any part of its upward motion.

The Turret Slide has a movement of 22 in., and an automatic feed which can be easily and quickly changed from the finest cut needed to the coarsest required, it has quick return by hand, and is counter-balanced by a weight inside of column.

Price includes countershaft, wrenches, &c., all complete, delivered 1/2 c. h. at Providence, R. I. Weight, 6,400 lbs.

Illustrated Catalogue mailed on application.



BROWN & SHARPE MFG. CO.,

PROVIDENCE, R. I.

No. 1

AUTOMATIC SCREW MACHINE.

13-32 in. x 1 1-2 in.

Patented in U. S., April 1, 1890. Patented also in Great Britain, France, Germany, Austria Hungary, Belgium, Switzerland and Canada.

This machine has a hole 13-32" in diameter through spindle and turns any length to 1 3/4".

England—STOK & BUCKMAN, 25 Whitechapel Road, London, E.

Germany—G. HUCHMANN, Aachenerstr. 5 Berlin, N. W.

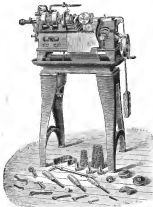
France—FRANCK FRERES & CO., 25 Rue Martel, Paris

France—F. G. KRUTENBROCK, 100 Rue de Nemly

Prague—FRANZ & SONS, 100 South Canal Street, and

World's Columbian Exposition, Machinery Hall Annex

Station 20, Corner Columbus J, 44 and 47 Center Aliso



BROWN & SHARPE MFG. CO.,

MANUFACTURERS OF

MACHINERY AND TOOLS

PROVIDENCE, R. I.



SIZES OF SURFACE PLATES.

4 1/2 in. x 6 in.	9 in. x 9 in.	12 in. x 12 in.	16 in. x 16 in.
6 in. x 6 in.	9 in. x 14 in.	12 in. x 18 in.	18 in. x 18 in.
6 in. x 12 in.	10 in. x 15 in.	14 in. x 14 in.	18 in. x 24 in.
6 1/2 in. x 18 in.	10 in. x 30 in.	14 in. x 18 in.	24 in. x 24 in.
	36 in. x 66 in.		

Illustrated Catalogue Mailed on Application

BROWN & SHARPE MFG. CO.,

PROVIDENCE, R. I.

TEST INDICATOR.

This indicator is especially useful to those erecting or inspecting machines. It is possible by its use to readily determine the degree of inaccuracy of a plane surface on the top, bottom or side of a piece of work, or to easily ascertain the amount of end movement, for example, of a spindle, or the extent to which a spindle runs out of true.

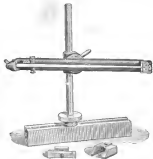
The upright post, or stand, may be clamped at any point upon the base by the knurled nut. The sleeve which carries the arm may be fastened at any height on the post or turned around the post to bring the arm on either side. The arm turns in the sleeve and may be set at any angle relative to the base, or may be inverted so that the point brought in contact with the work will be downward rather than in position shown in cut.

S. A. SMITH,

Western Representative.

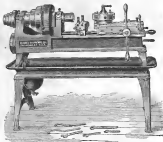
23 So. Canal St.,

CHICAGO, ILL.



BROWN & SHARPE MFG. CO.,

PROVIDENCE, R. I.



No. 6 SCREW MACHINE.

This machine is suitable for making studs, screws and a large variety of small parts of machines, from the bar, also for finishing work held in a chuck when several tools are required or a number of operations are to be performed. Diameter of hole in spindle 1 3-16". Diameter of holes in turret head, 1 1-4". Length that can be milled, 6". Weight, about 2,000 lbs.

S. A. SMITH, Western Representative,

23 So. Canal Street,

CHICAGO, ILLS.

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**STANDARD
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CYLINDRICAL GAUGES,
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SCREW SLOTTING MACHINE.

This machine is used for slotting screws to $\frac{3}{8}$ " in diameter and $8\frac{1}{2}$ " in length.

With it a boy can slot from ten to fifteen thousand screws a day.

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CHICAGO, ILL.—FRED. A. RICH, 22 South Canal St.



BROWN & SHARPE MFC. CO., Providence, R. I.

No. 3 UNIVERSAL GRINDING MACHINE, 20 in. x 72 in.



For grinding internal or external, hard or soft, cylindrical or conical surfaces, swings 20" in diameter and takes 72" in length—Net Weight 9 also pounds.

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MILLING AND GRINDING MACHINES.

Providence; R. I.



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SENT ON APPLICATION.



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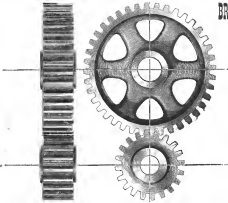
We have enlarged
our plant for cutting
Gears, and solicit
orders for all sizes of
Spur Gears up to 84"
diameter. Bevel
Gears 48" diameter.

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S. A. SMITH,

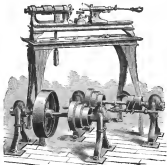
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It often takes the place of
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FOR WORKING

IRON and STEEL.

SMALL TOOLS

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Leading Awards

at all

International Expositions .

since 1867. . .

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FRANCE—FENWICK FRERES & CO, 21 Rue Martel Paris.

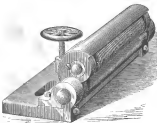
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GRINDSTONE TRUING DEVICE.



One of the most disagreeable things to be done in a workshop is the Truing of Grindstones. It is, therefore, often the case that they are allowed to become quite out of shape and untrue, very much to the annoyance of the workman, who finds it almost impossible to grind his tools in a proper manner. The above cut illustrates a device which is well adapted for truing and keeping the face of grindstones constantly in good shape. This can be instantly applied to the face of the stone, working automatically, without interfering with the constant use of the stone, and does the truing without raising any dust.

BROWN & SHARPE MFG. CO.

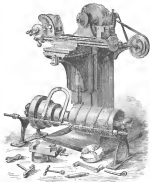
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MANUFACTURERS OF MACHINERY AND TOOLS.

Gears Cut and Index Plates

MADE AND DRILLED TO ORDER.

Illustrated Catalogues sent per mail on application.



THE PATENT UNIVERSAL MILLING MACHINE, shown in the annexed cut, has all the movements of a plain milling machine, and the following in addition: The carriage moves and is fed automatically, not only at right angles to the spindle, but at any angle, and can be stopped at any required point. On the carriage, centers are arranged, in which reamers, drills and mills can be cut either straight or spiral. Spur and bevelled gears can also be cut. The head which holds one center can be raised to any angle, and conical blanks placed on an arbor in it, cut straight or spiraling. Either right or left hand spirals can be cut.

BROWN & SHARPE MFG. CO.,

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No. 3 PLAIN MILLING MACHINE.

COMPACT, POWERFUL AND RIGID.

The work can be quickly placed in position and quickly moved after the cut is taken.

The table is 9 inches wide, 27 inches long, and has 15 inches longitudinal and 3 inches transverse movement.

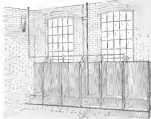
Weight about 2700 Pounds.

*The Machines and Tools described in Catalogue
are usually kept in stock.*

S. A. SMITH, Western Representative,
23 So. Canal St., CHICAGO, ILL.



SANITARY CLOSETS, FOR SHOPS and FACTORIES.



The accompanying cut shows an arrangement for closets in use at our works for several years and which has given universal satisfaction. The latrines, a, one of which answers for two closets, are filled to within a few inches of the top with water, an overflow in a valve in the center of each preventing their being filled too full. The water is let into the latrines through a pipe which extends around the inside of the same, and the pipe, being perforated on the under side, washes the sides. These latrines are emptied once or twice each day by raising the valve by the rod & allowing the contents to escape through a soil pipe. The closets should be ventilated under the seats into the chimney where possible, as shown, by an opening at *x*. Special pipes, connecting with upright soil pipe, are shown at *A*, *B*, and *C*.

We are now prepared to furnish castings, either rough or fitted complete for these closets, with drawings showing construction of wood work, etc.

ILLUSTRATED AND DESCRIPTIVE CIRCULAR, WITH PRICES, MAILED ON APPLICATION.

BROWN & SHARPE MFG. CO., PROVIDENCE,
RHODE ISLAND.

BROWN & SHARPE MFG. CO.,

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Special Cutters for Milling T Slots.

S. A. SMITH,

Western Representative.

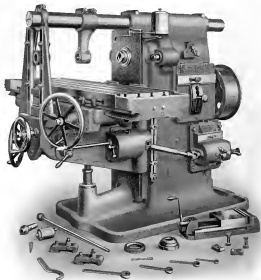
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Brown & Sharpe Mfg. Co.,

The Quality and Quantity

of Work Turned Out on the B. & S. Constant Speed Drive Milling Machine is a Forcible Example of the Rigidity of its Construction.



No. 5-B HEAVY PLAIN MILLING MACHINE
(SHOW ABOVE)

THE entire line of Constant Speed Drive Milling Machines is designed for heavy service and as a whole is a striking illustration of solidity in construction. The rigid control of the moving parts as the table, saddle and knee, together with the quietness of the running gears when the machine is under heavy service show that the design is correct and solidity has been attained.

THE ELECTRIC ERA.

EBERHARDT'S PATENT.

With rare exception, this machine is cutting
ALL

ELECTRIC MOTOR GEARS MADE.

In use by the following for cutting these gears:

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Forest City Brass Works,
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United Electric M'g Co.
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F. Hammer Patent Mfg.
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F. B. Reed,
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Waterfront Government
Arsenal,
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Motor Co.,

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and others.



GOULD & EBERHARDT, Newark, N. J.

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Pat. Dorrrell Automatic Gear Cutter,

Systems of sizes up to three.

Barber & Coyle, Manufacturers of Pipe Cutters, Bridgeport, Conn. 28 inch. "Does far more than you promised."

J. W. Hardy, Elevators, 100 Canal Street, New York City. 24 inch.

"Machine has not cost a cent for repairs or loss of time since first received."

Robert Turner, Chicago, Ill. 30 in. "Extremely pleased with quality of work I have got the best machine in the city."

"Extremely pleased with quality of work I have got the best machine in the city."



NOTICE.

It is being circulated that some machines can do 50% and another special machine $\frac{1}{3}$ more work than the Eberhardt

GEAR CUTTER.

We have yet to see the one that does it; the facts are, we are cutting more gears, either cast iron or steel, where our machines are placed alongside of these other machines. We can refer intending purchasers to shops where these are running.

We warn the consumer from purchasing infringing machines. Write to

**GOULD & EBERHARDT,
NEWARK, N. J.**

This is the machine that is cutting (with rare exceptions) all the Electric Motor Gears.

Tools can be seen in operation in Machine, Maxwell & Moore's Machine shop, Annex Machinery Hall, World's Columbian Exposition, Chicago, Ill.



97 to 113
N. J. R. R.
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N. J.

E. GOULD &
EBERHARDT



PATENT SHAPERS,
Quick Adjustable Stroke.
Can be changed while in motion.

Office: ROBERT TARRANT,
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Messrs: E. Child & Stoddard,
Newark, N. J.

It is here probably got to have
another shaper machine, and
should be pleased to have you
quote prices. We are extremely
pleased with the gear cutting
machine, and think we have got
the best one in this city. It has
been going constantly since it
was set up, and we have yet to
find the first objection to it.

Very truly, etc.,
ROBERT TARRANT



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87 to 113

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THE BROWN COTTON GIN CO.,

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Gentlemen:—In regard to the No. 1, a 20 in. x 5 ft. Planer, bought of you some time ago, it gives me pleasure to say that it is the best planer we ever saw. The man we have on it says, "Take the cake," being the best he has run during the thirty years he has been running planers. We are well pleased with our purchase, and no other planer would fill our orders, and we will have no other.

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Will Cut All the Corn
The Operators Can Handle.

Simple in Construction,
Easy Operated, and

Will Last a farmer for Years.

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Every Twenty-five Acres Cut.

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 cutting from 3/8 in. to 6 in. diameter,
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THE ALLIGATOR WRENCH.

Teeth cut diagonally, Grips Round Iron or Pipe.

PATENTED AUGUST 22, 1893.



Patent Wrench.



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Wayne Combination Washer!

The Best and Most Profitable Machine for
the Dealer to Handle.

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IMPROVED DESIGN.

Weight, 25 lbs. Weight, packed for shipping, 35 lbs. Sent by Express C. O. D., or freight on receipt of price.

It is adapted to the widest range of scroll sawing, from the coarse bracket three inches thick, to the finest well bracket one eighth of an inch thick.

No shop, or wood worker's kit, complete without it.

Now only **THIRTY DOLLARS & HALF**, at regular prices, every where.

As a Foot Power Machine it is warranted to cut (at one pass) through pine 2 inches thick, 1 foot per minute, 1 inch thick, 4 feet per minute. Walnut 2 inches thick, 2 feet per minute, 1 inch thick, 3 feet per minute.

Every builder, cabinet and pattern maker, cabinet or worker in wood should have one. Only three years in the market, yet thousands are using them. Send for full description to:

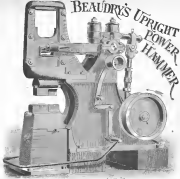
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These sizes are not necessarily in stock, but are nearing

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This Hammer possesses advantages superior to any other in the market. It has neither cylinders, valves or piston rods, consequently repairs are trifling. It takes up less space, has power to drive 1 strike per inch hammer and trawl blows than hammers with double the weight of iron.

Cost of 60 Lb. Hammer.



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It can be worked to strike good wrought-iron bolts on a sled and finish bar when a 100-pound hammer is used, and can be used on the work to a far greater advantage than any other hammer known. Manufactured by the

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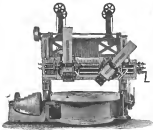
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Manufacturers of

*** Metal Working Machine Tools ***

of all descriptions and a great
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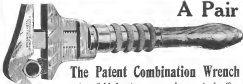
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ers, Sloters, Milling and Bor-
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mers, Steam and Hydraulic
Presses, Cranes, Punches,
Shears, Bending Rolls, Plate
Planers, &c.





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Metal Working
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The Patent Combination Wrench

is available for pipe or nut work as required, will hold anything the jaws will fit over and does the work of half a dozen ordinary wrenches.

The Steel Handle Wrench has great strength, can be used under the most adverse conditions and is practically indestructible.



The Steel Handle Nut Wrench

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FRANK L. WILCOX, Treasurer.

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Builders of



Iron and Steel Bridges and
Buildings.

The above illustration taken direct from a photograph and shows the interior of a Machine Shop designed and built by us for The Bell & Wood Co., at Elizabethport, N. J. The building is 90 feet in width by 160 feet in length. The central portion is 40 feet from center to center of traveling crane rails, while the two story wings on each side are 20 feet in width. We built this entire building, including the brickwork and foundations, the whole complete ready for the machinery.

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No. 8 Railroad Avenue, East Berlin, Conn.

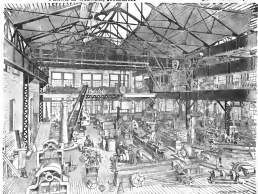
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The above illustration is taken direct from a photograph and shows the interior of a Machine Shop designed and built by us for The Bridgeport Machine Tool Co., at Bridgeport, Conn. The building consists of iron posts, each 40 feet in width. The stone in the immediate foreground being set story high by the driving press, while other portions of the building shows on the right is two stories high—light work being done on the second floor.

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THE BERLIN IRON BRIDGE CO.

Office and Works: East Berlin, Conn.



The above illustration shows the construction of an iron truss roof designed and built by us over the Machine Shop for The Titusville Iron Company, Titusville, Penn. The building is 70 feet in width by 225 feet in length, the iron roof trusses being arranged to carry shafting.

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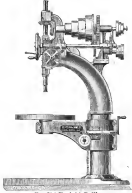
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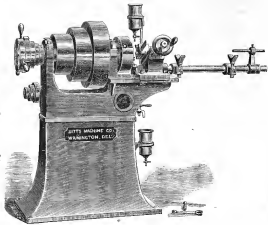


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MACHINES OF ALL KINDS OF

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Will make 25 cuts of 2 inch round iron in ONE hour, and leave the ends in FIRST RATE condition.

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Boring and Turning Mills

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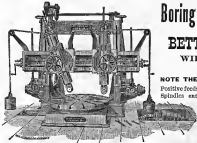
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Spindles not round, but of such shape as will allow ready adjustment for wear.

Great range of feed and abundance of power.

Send for list of machine tools on hand for immediate delivery.



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Betts Machine Co.

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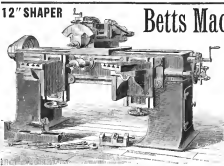
TOOLS

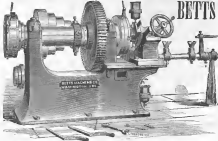
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Most Approved Design





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Machines: 3 $\frac{1}{2}$ in., 4 in., and
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6 IN. CUTTING-OFF MACHINE.

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Send for cat, description, etc.,

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A SPECIALTY.

ALL SIZES WITH TABLES, COKE BURNERS AND ALL
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Dies of all kinds, Squaring,
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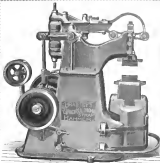
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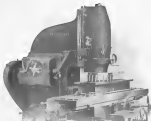
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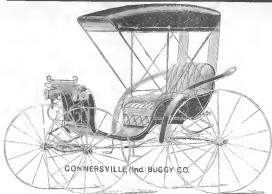
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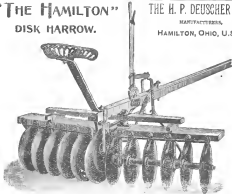
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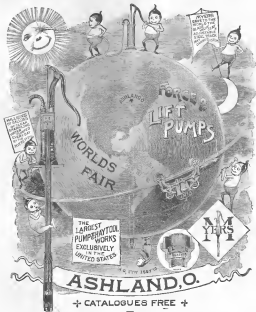
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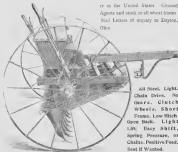


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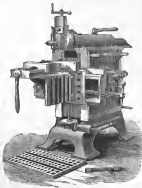
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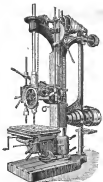
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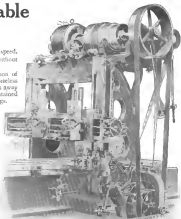
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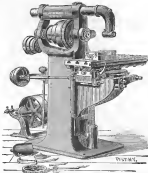
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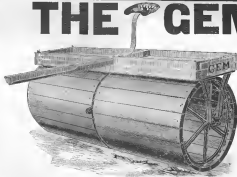
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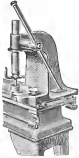
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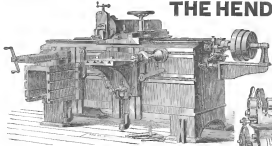
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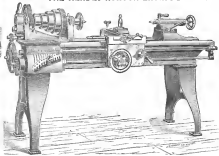
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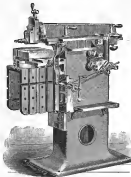
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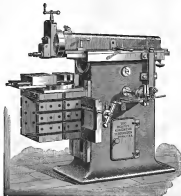
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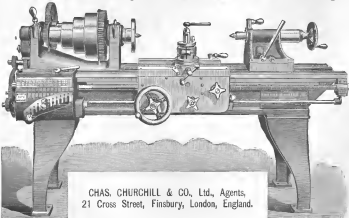
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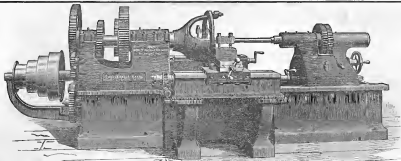
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CHAS. CHURCHILL & CO., Ltd., Agents,
21 Cross Street, Finsbury, London, England.



30 INCH, 42 INCH and 60 INCH PULLEY LATHES

For Simultaneously Boring and Turning Pulleys, both straight and crowning face, Cone Pulleys, Gear Blanks, and a variety of other work.

Manufactured by **The HENLEY MACHINE TOOL WORKS, Richmond, Ind.**

HAND AND POWER PLANER.

THIS cut represents a combined hand and power planer. It is made from new designs, is well proportioned, and built in a first-class manner.

The machine is run by two belts running at a high rate of speed, and is a powerful tool. It has automatic horizontal feed and the head is graduated to plane at any angle.



The table is gibbed to the bed to prevent its lifting on a heavy cut; holes in table are drilled and reamed; slot in table is milled; racks and gears are cut; sliding surfaces are accurately scraped to bearing; feed-screws are of steel with square threads; nuts, screws and wrenches are case-hardened. The machine can be run by hand power with crank by simply slipping out a gear. The tool can be depended upon to do accurate work.

With this machine is furnished a bench, counter shaft, graduated chuck, index centers, crank for hand power and necessary wrenches. Can also furnish small cutting tools if desired.

18" x 18" x 38"

Speed of Counter Shaft 170 Revs.

Size of Tight and Loose Pulleys on C Shaft, 8x2.

HENDEY MACHINE CO.,

Torrington, Conn.

36-inch x 36-inch x 8-ft. Machine.

OTHER SIZES.

60 in. x 60 in. x 12 ft.

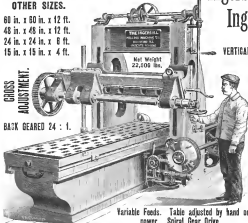
48 in. x 48 in. x 12 ft.

24 in. x 24 in. x 8 ft.

15 in. x 15 in. x 4 ft.

**CROSS
ADJUSTMENT.**

BACK GEARED 24 : 1.



Variable Feeds. Table adjusted by hand or power. Spiral Gear Drive.

Ingersoll Heavy Slab Milling Machines, Ingersoll Patent Milling Cutters

OF ANY SIZE OR FORM.

**VERTICAL SPINDLE MILLING MACHINES, TRAVERSE HEAD MILLING MACHINES,
ALL FOR HEAVY WORK.**



Pat. Dec. 24, 1880.

Give us an opportunity to name you a time in which we will **guarantee** our machines and patent cutters to do your work. Write for fuller information and photographs. One of our Milling Machines in many instances will do the work of five planers.

The Ingersoll Milling Machine Co.,

ROCKFORD, ILL., U. S. A.

P. O. BOX 3450.

HEWITT'S PATENT SULKY CART!



Know All Men, That whereas Mr. J. W. Hewitt, patentee of the Combination Sulky Cart,

Patented Oct. 2nd, 1884, No. 412,829

Feb. 25, 1892, No. 445,126

J. W. Hewitt, of Toledo, O., has the exclusive ownership and control of said patent throughout the United States, except a shop right of Jackson County, Mich.,

owned by F. Hazen, for the term of five years. Said term ending Feb. 1, 1896. Any other party or parties using or claiming ownership or control other than above, are infringing on the right of the patentee.

I will sell this cart the next sixty days from date for \$25.00. Money with order.

J. W. HEWITT, Toledo, Ohio.

For SPECIAL DISCOUNT mention FARM MACHINERY.

Farm Engines AND Steel Boilers



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It will Pay to Send for Pamphlet and Terms to Dealers. Address

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For SPECIAL DISCOUNT mention FARM MACHINERY

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ALSO BUILDERS OF OTHER

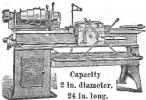
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BY NEW METHOD.

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2 in. diameter,
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2 BY 24 FLAT TURRET LATHE.

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They are Comfortable,
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And merit the enthusiastic praise they receive from every user.

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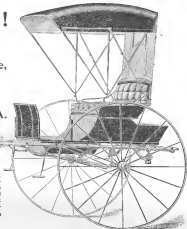
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No. 8—Pole or Shafts.

Here we show our regular No. 8 cart with Pole and Sliding Top. We can furnish any of the styles of Hammock Carts with top, pole or shafts if so stated at time of ordering. These carts work nicely with poles, and actually carry tops with far less strain to the top than ordinary four-wheel vehicles.





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Semi-Racer Style.

Weight, 35 Pounds.

NEVER SO LOW AS NOW.

We have small stocks that we would rather sell this season than keep until next season. That's why we are quoting such low prices—not because the bicycles are not worth far more.

Full Size Safety Bicycles, with Pneumatic

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Will lift hot water through hot section pipe. Guaranteed to work under all conditions.

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Lathe Dogs & Clamps,

of both Iron and Steel.
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EXPANDING MANDRILS,
 and also of the
 Patent Lathe Dog
CO. W. WOODRUFF & CO.
 100 N. 3rd St., PHILADELPHIA, PA.



THE LITTLE GIANT

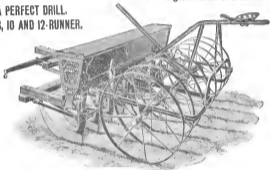
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14, 16, 18 and 21-inch Swing. Large Endless Spindle.

Taper Attachment, Automatic Chasing, Compound Rest, Lead Screw, under Front V. All indispensable in shops.

Extra heavy, Overcenter, and easily handled.

24, 27, 30 and 36-inch Swing. Double Legs.

**CABINET TURRITS, AUTO. MONITORS, FOX
MONITORS, SPEED LATHES, &C.
COMPLETE BRASS WORKERS' OUTFITS.**



**ENGINE
LATHES,
TURRET
LATHES,
PULLEY
LATHES,
CHUCKING
LATHES.**



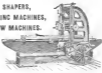
26, 28 & 30-inch Triple Gear Shapers

Machine changed while machine is running. Gear can be passed through head of machine and key set out to same to any length. Extra heavy cast. Tables slotted on all sides.

Special 30 in. Shaper with auto. down feed.

COMPLETE MACHINE SHOP EQUIPMENTS A SPECIALTY.

**IRON PLANERS,
IRON SHAPERS,
MILLING MACHINES,
SCREW MACHINES.**



24, 30 and 36-inch Planers.

Extra deep beds and tables. Powerfully geared. Heavy cast. Designed for extra heavy duty. All feeds and strokes regulated from both sides. Improved design for building Planer Beds.

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PRESSES,
BOILER
MAKERS'
DRILLS,
POST
DRILLS.**



28, 30, 32 and 40-inch Drills.

Automatically stop to feed. Quick reverse on right side. To be operated from top. Large cones and long bits.

18 and 20-inch Cast Shaper,
Stroke changed and adjusted while run-
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Irreversibly plane to a line.
Detachable Tables.

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IMPROVED IRON PLANERS.

24 inch, 32 inch, and 36 inch Wide.
DESIGNED FOR EXTRA HEAVY DUTY.

THE LODGE & DAVIS MACHINE TOOL CO.

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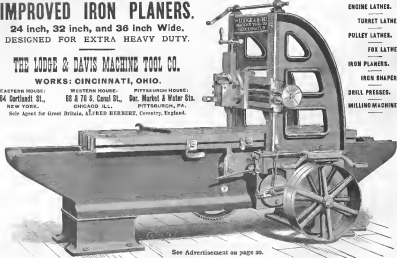
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68 & 70 S. Canal St.,
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PITTSBURGH HOUSE:

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ENGINE LATHES.

TURRET LATHES.

PULLEY LATHES.

FOX LATHES.

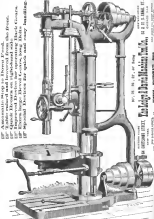
IRON PLANERS.

IRON SHAPERS.

DRILL PRESSES.

MILLING MACHINES.

See Advertisement on page 20.



- DR. Automatic stop to prevent feed.
- DR. Table rotated and removed from the front.
- DR. Speed levers on right-hand side.
- DR. Improved clutch for starting back gears.
- DR. Heavy large bevel gears, long bolts.
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 ESTABLISHED 1850.

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See illustration on page 24.

IMPROVED IRON PLANERS.

24 inch, 32 inch, and 36 inch Wide.

DESIGNED FOR EXTRA HEAVY DUTY.

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TURRET LATHES,
PULLEY LATHES,
CHUCKING LATHES,

IRON PLANERS,
IRON SHAPERS,
MILLING MACHINES,
SCREW MACHINES,

RADIAL DRILLS,
DRILL PRESSES,
BOILER MAKERS' DRILLS,
POST DRILLS.

THE LODGE & DAVIS MACHINE TOOL CO.

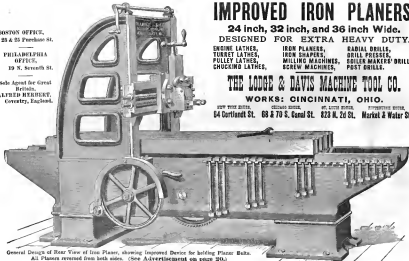
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NEW YORK BRANCH, CHICAGO BRANCH, ST. LOUIS BRANCH, PITTSBURGH BRANCH,
64 Cortlandt St. 68 & 70 S. Canal St. 828 N. 2d St. Market & Water Sts.

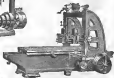
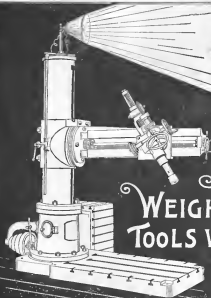
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General Design of Rear View of Iron Planer, showing Improved Device for holding Planer Beds.
All Planers reversed from both sides. (See Advertisement on page 20.)



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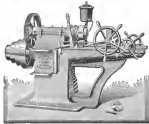
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Standard Engine Lathes, Turret and Pulley Lathes, Planers,
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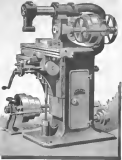
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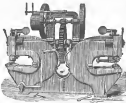
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Double, Single, Angle-bar,
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Multiple, 15 to 18 in. of
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Punches and Shears,
Over 200 Sizes.

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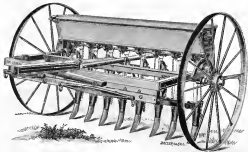
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GRAIN  DRILLS  !

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Strictly first class, Moderate prices, Perfection of workmanship.
Positive feed.
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Extra heavy.
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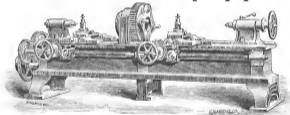
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SPECIAL PULLEY MACHINERY.



PULLEY LATHE.

BUILT BY
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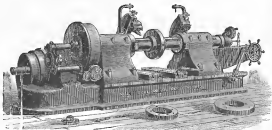
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PULLEY BORER.

MACHINE TOOLS.



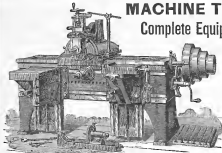
CYLINDER BORING MACHINE

THE **NILES TOOL WORKS** CO.,
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THE NILES TOOL WORKS CO., HAMILTON,
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MACHINE TOOLS.

Complete Equipments.



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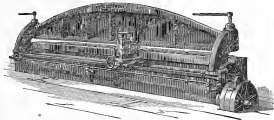
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MACHINE TOOLS.



63-INCH FORCE LATHE.

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Correspondence Solicited.

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SLOTING MACHINES.

In sizes from 6 $\frac{1}{2}$ -inch stroke to 54-inch stroke. Cutter-bar counterbalanced and provided with quick return motion. Feeds are longitudinal, transverse and circular, all automatic.

Special Iron and Steel-working machinery for all classes of machine shops.

Correspondence solicited.



14-INCH SLOTTING MACHINE.

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NILES TOOL WORKS,

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MACHINE TOOLS.

SCREW MACHINES.



No. 2 SCREW MACHINE.

Machine Shops of all kinds equipped complete. Correspondence solicited.

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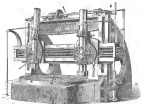
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LEWIS BLOCK

NILES TOOL WORKS,

HAMILTON, OHIO.

MACHINE TOOLS.



18-FOOT BORING AND TURNING MILL.

BORING AND TURNING MILLS

A SPECIALTY.

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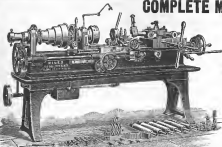
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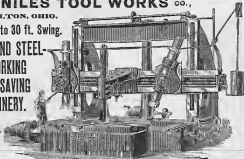
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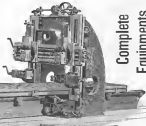
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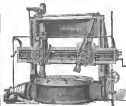
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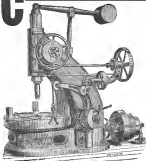
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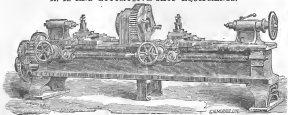
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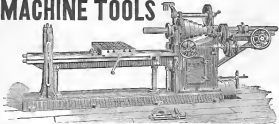
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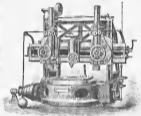
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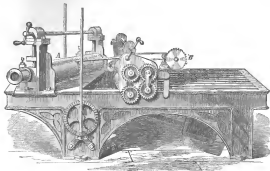
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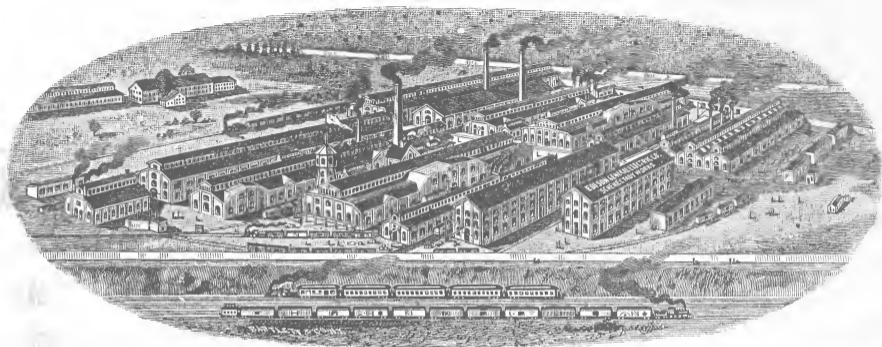
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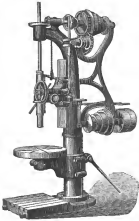
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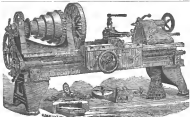


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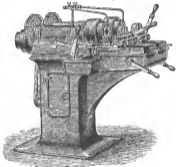
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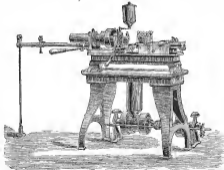
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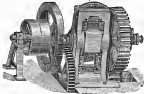
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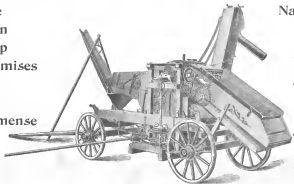
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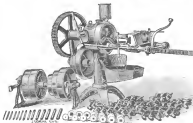
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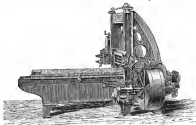
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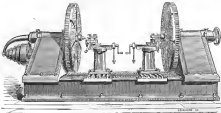


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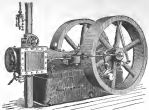




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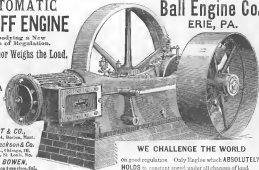
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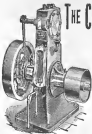
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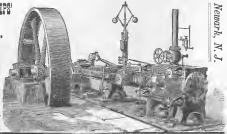
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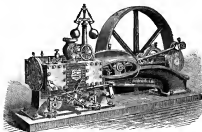
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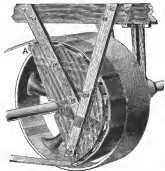
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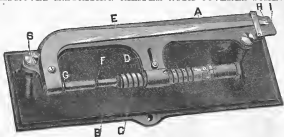


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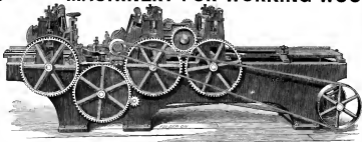
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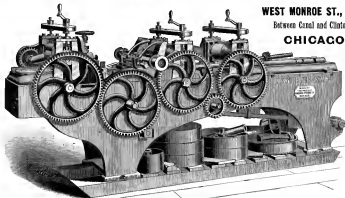
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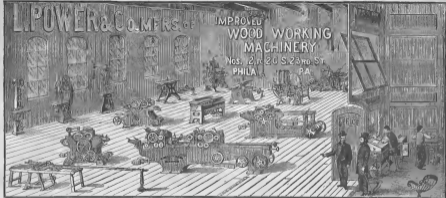
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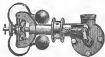


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MAKING SAWS.

STANLEY.

Owing to the fact that many of the machines used in saw manufacturing are designed and made by each firm for its own use, and also to the fact that many of the processes in saw making have been developed along independent lines, there are many things in a saw factory which are not generally known, and the processes are often regarded as trade secrets. However, inasmuch as this policy of secrecy may be, it is followed by nearly all saw manufacturers; yet it is safe to say that not one firm is in ignorance of the important processes and methods used by its competitors.

E. C. Atkins & Co., of Indianapolis, Ind., is one of the few saw manufacturers realizing the futility of trying to keep their machines and processes secret. This firm, which is one of the largest and oldest manufacturers of saws in the United States, through the courtesy of Mr. Atkins, the exper-

and the corresponding to the number of teeth required. These are set up in the press and an indexing disk of the same number of teeth as required in the saw is placed on a stand, as shown at A in Fig. 1. The saw blank is then placed over this indexing disk and securely clamped, by means of a nut on the stand. The carriage holding the blank is then moved in or out and the entire fixture moved to the right or left, until the disk is in the correct position for the punch to cut the teeth at the proper angle and depth. The teeth are then rapidly cut, the spacing being obtained by the indexing plate. All of the circular and inserted tooth saws are cut out by using this kind of punch press jig.

When hardening the saws, they are held flat in a special gas furnace, and heated slowly. When evenly heated, the saw is drawn out and placed on the lower plate of a grating clamp, as large or longer than the saw, and a similar grating plate is lowered from above. The saw is thus kept flat, and prevented from warping, and is quickly lowered into a large tank



Fig. 1. Steel disks for circular saws and punches and dies for circular files and teeth.



Fig. 2. Machine for grinding the blades of circular saws.



Fig. 3. Finishing and testing a circular saw.



Fig. 4. Special three-wheel grinder for grinding the teeth of inserted tooth saws.

iment, gave the writer the opportunity of taking a number of photographs, and obtaining the information necessary to give the readers of MACHINERY an idea of how the Atkins saws are made. This company turns out thousands of hand saws, but the main product is large circular and large hand saws. The circular saws are of two general types, the solid and the inserted tooth.

The steel for the saws, which is made especially for the firm, comes in circular disks or in long strips or bands of the proper size and standard gauge for the various standard circular and hand saws made. A number of the steel disks from which the circular saws are made, are shown in Fig. 1. Several center hole and tooth-forming punches and dies are also shown in this engraving.

In working up the steel disks into saws, the center hole is first punched in a punching press, and in the next operation the teeth are cut. The operator selects a tooth-forming punch

of all. When the saws are taken out of the hardening bath, they are placed in the machine shown in Fig. 2, where the sides are ground. This machine is provided with a large grindstone, which is fed in or out by means of a hand-wheel, shown just back of the operator. The saw is placed on an arbor mounted on a carriage which automatically feeds it across the face of the grindstone. The grinding begins at the outer edge of the saw, and as the operation proceeds, and the grindstone is gradually fed in toward the center, the saw is made thinner as the center than at the edge. This method provides a free-cutting saw with little tendency to bind.

While grinding, the saw revolves in the same direction as the grindstone, but more slowly, as belt-driven rolls, one on each side of the saw, set as brakes, and thus make grinding possible. The practice of running the saw in an opposite direction from that of the wheel, usually followed in grinding small milling saws, would be practically impossible in this case, owing to the leverage caused by the size of the

* ASSOCIATED ENGINEERS OF MACHINERY.

saw and the width of the grinding wheel. Besides, it is doubtful if there be any advantage in running the saw and wheel in opposite directions.

During the grinding process, water pours down between the saw and the stone, and only a few minutes are required to grind the sides of the largest saws, with no danger of drawing the temper. After grinding the sides of the saw, it

it looks so—and it takes long practice to become an expert. Twenty-five or thirty men are employed in this department, and a large majority of them are well past middle age, and have been doing this work for years. Fig. 3 shows the shape of hammers and the mill used for hammering the large circular saws. A few mechanics outside of sawmill men know what "teasoning the saw" means, the following is quoted from



Fig. 3. Polishing rig used when finishing circular saw teeth.



Fig. 4. Polishing circular saws.



Fig. 5. Grinding machine for treating the teeth of circular saws after finishing.



Figs. 9, 10 and 11. Testing the sides of a circular saw to determine the need of hammering and teasening.

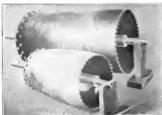


Fig. 12. Round saws.



Fig. 13. Punching the traps in band saws.

is placed on an arbor in another machine, and while revolving rapidly, is polished by holding a polishing pad with a wooden handle against the side and feeding it back and forth on the top of the rest, as shown in Fig. 6. Flour of emery is used on the pad for polishing. Then the teeth are treated up on a special grinding machine, as shown in Fig. 7.

One of the most important operations on the saw is the hammering and teasening. This work is to be done—or at least

a pamphlet of instructions issued by E. C. AGGLES & Co. for their customers.

"For the benefit of our patrons and sawyers using our saws, we take pleasure in explaining the general principles involved in the hammering and teasening of circular saws. The practice taught by masters of the art thirty years ago, when only saws of small diameter were used, was that a circular saw, to do proper work should be left first between the center and the

rim, and open as to its whole diameter, whereas experience has shown that it is best to open out the body of the saw between the center and the rim to the extent required for the speed the saw is to run.

"Very high speed and thin saws require that the saw be opened out until it takes a strong push or pull to throw the center either way when the saw is standing upon the floor. When the saw is in proper tension and



Fig. 12. Forging for Teeth and Holder for Inserted Tooth Saws.

only of the saw should vibrate, while the rim should be nearly or quite steady.

"Oursing a circular saw, or after note heating and cooling of the rim, will permanently expand a saw at the rim, and in consequence it will become too stiff in the center or body, and run 'snaky.' A few strokes of a round-faced hammer on both sides of the saw at the proper places will restore the tension. In Fig. 17, the portion of the saw to be hammered is indicated by the dotted lines. The same treatment is required if the saw is put up for too low speed. The rule is that it must be more open or 'looser' in the body of the saw for fast speed than for slow; for hard than for soft wood.

"When the saw is standing on the floor and shaken with the hand and the center and rim both vibrate, it requires more hammering on the line next to the rim. When opening out the body of the saw, do not hammer within 6 inches to 10 inches of the center.

"Observe the motion of the saw when on the transfer and running up to full speed; if it runs wavy on the rim, it needs opening out at the dotted lines. If it runs steady and true out of the log, it is the fault of the hanging, tying, firing or management if it does not run steady and true in the log.



Fig. 14. Large Grinding Machine for Band Saws.

"Fig. 8 illustrates the examination of the saw with the straight-edge in adjusting tension; the center of the saw resting on the saw, the rim back of the saw supported on a narrow bench extending from the saw to the wall, and the opposite part raised with the hand, the straight-edge extending from the center toward the rim of the saw. If the saw is properly opened in the body, the portions indicated by the dotted lines in Fig. 17 will drop away from the straight-edge equally all around the saw.

"To equalize the tension, the parts that drop least require hammering until the tension is even and all parts indicated by the dotted lines drop equally all around the saw, the center line dropping a little more than the others.

"Hammering to take out bumps should always be done on the high side or on that side which touches the straight-edge. Lumps or ridges open or near the rim may be found with the straight-edge by examining that part of the saw, with the center of the saw resting on the saw, but lumps or ridges in the body should be found with the saw standing perfectly perpendicular upon the floor, Figs. 9 and 10. Mark the high spots with chalk, and hammer where marked, on an anvil.

"Allowance must be made for changes in tension produced by the blow of the hammer, so every blow stretches and opens the saw at the point struck.

"Lumps usually run in ridges and should be hammered out with a cross peen hammer, the peen following the ridge in the direction in which it runs as discovered by the straight-edge. Round lumps may be hammered down with the round face hammer, or with a cross peen hammer, by changing the position of each blow so that the strokes cross each other. The strokes should be directly on the lump or ridge."

The foregoing extract will not only give a good idea of what hammering and tensing means, but it will also give a fair idea of how it is done.

In the inserted tooth circular saws, the cutting teeth are forged in pairs, as shown in Fig. 11, where A is the forging unfinished, B the part trimmed off, and C the tooth. At D is shown the tooth and holder ready to be put into the saw.



Fig. 15. Dressing a Band Saw by Rolling.



Fig. 16. Dressing a Band Saw by Rolling.

The teeth are ground on both sides and on the cutting edge at one operation, on a special three-wheel grinder, shown in Fig. 4. The dresser in which the tooth-holder or 'stank' is inserted is shown in Fig. 11, one tooth being already in place at E and another just being put in with a wrench at F. The saw is held in position by a stud which passes through the center hole and by a clamp, operated by a hand-wheel, which grips the rim.

A special form of saw called the barrel saw, which is used

for making cut barrel staves, as shown in Fig. 11. In these saws only a narrow strip at the edge is made of saw steel, the body being made of a cheaper material, to which the saws are brazed. The cutting blades are made in the same way as a hand saw, with the ends tipped and brazed.

In making hand saws, the teeth are set in a punch press, as shown in Fig. 12, the teeth being set against a stop the right distance from the punch, and the feeding being done by hand. These saws are hardened by fastening them to a "dummy" ring, which is slowly drawn through a gas furnace and into an oil tank. The whole operation is continuous and practically automatic. After hardening, the hand saws are ground by feeding them under a large grindstone. The table is tilted so as to grind the saws thinner at the back.



Fig. 13 Diagram indicating the lines along which a Circular Saw is Ground.

An automatic hand saw tooth grinder is shown in Fig. 14. This grinder will take saws of any size and length, for small saws of similar type, smaller machines of the same design are used. These smaller machines are common in wood-working shops.

The manner in which hand saws are rolled to give them the proper tension is shown in Fig. 15. To run properly, a hand saw must be open in the middle, and it is rolled as shown by the lines in Fig. 15. If it is too open, it is rolled as shown in Fig. 16.

Hand saws and crescent saws are both ground true on the back, the same as the band saws, and in the same way. They



Fig. 15



Fig. 16

Diagram 1

Figs. 15 and 16 Lines along which a Hand Saw is Tensioned

are heated and held in long chucks while being dipped in the hardening oil bath. The teeth on the hand saws are set with a light hammer. The men engaged in this work, the setters, use their hammers as steady as the ticks of the clock and never miss a tooth.

* * *

The length of new railways opened in the United States last year was 2,214 miles, showing a decrease of 1,995 miles, or 15 per cent, as compared with 1907. The largest new construction on the part of any one company was 750 miles of track involved in the Chicago, Milwaukee and St. Paul Railroad's Pacific Coast extension. The railway network of Canada was increased last year by 1,155 miles, and that of Mexico 435 miles.



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The public will understand that we have no relations with American or European builders of so-called "Improved Corliss Engines," and that the best and perfected Engines of Mr. George H. Corliss, embodying his latest ideas, are to be obtained, in America, exclusively at our works.

ALSO MANUFACTURERS OF THE

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Especially adapted for compound and triple expansion engines requiring superheated steam and at very high pressure.

The Bicycle of the Future.

The bicycle of 1993 will be built very much the same lines as the safety of 1893—that is, with two small wheels very nearly the same size, says a writer in the Scranton Truth. This was the plan of the first machine built in 1817, and now after a lapse of seventy-six years we have come back to the original design. A machine on this plan can be built stronger and lighter than on any other model. With the weight between two wheels there is less vibration than when it is over either one of them, as in passing over an obstruction the weight is lifted only half the distance of the former case that is in the latter.

Then by the use of some alloy of greater tensile strength, weight for weight, than steel, and by filling the tires and the tubes in the framing with hydrogen instead of air, the weight of road machine will be reduced to ten pounds or less, while racing machines will not weigh half that much. The machine will also be made so that it can be folded up and carried about or stowed away in some corner. By improvements in the constructions of the bearings of moving parts friction will be almost wholly eliminated and the method of applying powder will be so perfected that there will be no such thing as lost powder.

The roads will be prepared especially for bicycles, the grades being very light and in fact, only sufficient to provide proper drainage. The surface will be hard and smooth, the outer edge of all curves being raised on a race track. The improvement in the rider will be equally marked. From the continued and increasing use of the wheel a race of people will be evolved that will take to cycling as readily as a foreign immigrant does to politics. Taking all these things into consideration, we may expect a speed of thirty miles an hour on the road and sixty miles an hour on the track. The use of the machine will be universal. Children will be taught to ride as they are now taught to walk. The suburbs of our great cities will extend from 60 to 100 miles in every direction. All patents will have expired and such large quantities of bicycles will be manufactured that the cost will be nominal and within the reach of all. There will be no more crowded tenement houses. The artisan, who will work only four hours a day, will live with his family in a cosy little home in the suburbs, where he can see the sunshine and breathe the fresh air. The use of the wheel will have so improved the stamina and physique of the race that the causes of death will be old age and accidents. Railroads will be used for the transportation of freight only. Every individual will own a bicycle. Those intended for long distance travel will be run by small but powerful storage batteries, which may be charged at automatic electric stations by connecting the battery to a dynamo and dropping a coin of small value in slot. With machines of this character it will be possible to attain a speed of 150 miles an hour and to overcome the wind pressure they will be fitted with wedge shaped wind shields made of some tough yet transparent substance. The bicycle will not be used in war for the simple reason that as dyspepsia will be unknown everybody will feel so well and be so good humored and disinclined to quarrel that there will be no one to go to war.

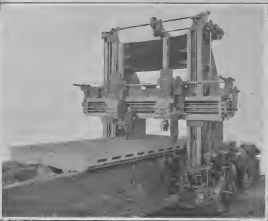


FIG. 1.—A DIELECTRIC PLANE. WEIGHT 25,000 POUNDS. 307½ HORSE-POWER DEVELOPED BY FOUR MOTORS. NEW MOVEMENTS HAVE BEEN ADDED TO THOSE OF THE STANDARD MACHINE.



FIG. 2.—MAIN DRIVE BY 175-HORSE-POWER MOTOR THROUGH BEARINGS AND FRICTIONAL CLUTCHES

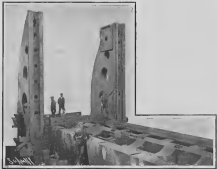


FIG. 3.—THE PLANE IN FIGURES OF ISOBOT.



FIG. 4.—THE TWO LARGE HILL WHEELS.

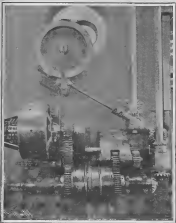


FIG. 5—SLOTTER DRIVE SITUATED AT BACK OF LEFT-HAND UPRIGHT

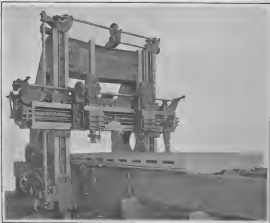


FIG. 5.—LEFT-HAND SIDE WITH MOTOR FOR SLOTTED BAR DRIVE AND PNEUMATIC CYLINDERS FOR RAISE

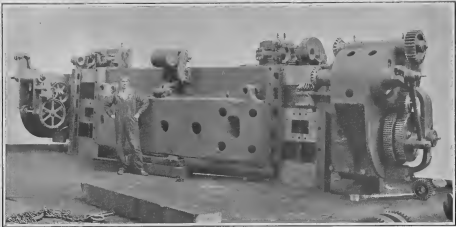


FIG. 7.—REAR VIEW OF THE CROSS RAIL
THE BIGGEST MACHINE OF ITS KIND EVER MADE.

A G I G A N T I C P L A N E R.

THE BIGGEST MACHINE OF ITS KIND EVER MADE.

PERHAPS the largest and heaviest metal-working planer ever built has recently been shipped from the Demant-Niles Works (Philadelphia) of Niles Demant-Pond Company. The total weight of the machine is 815,000 pounds, or 422½ tons. Four motors with a total capacity of 307½ horsepower are required to operate this remarkable tool.

The machine is, in general effect, an extremely large planer, but in addition to the movements found on a

supply in the shop, to which, however, it can be connected if it seems desirable.

A complete switchboard is furnished for control of all the motors.

The distance between uprights is 14 feet 4 inches;

style of drive is used for the slotted and gives a cutting speed of 18½ to 20 feet and return speed of 37 feet to 71 feet. Cutting speed for cross planing is 11½ to 19 feet and return speed 36 to 42½ feet. The cross traverse speed to the heads is 60 inches per

standard machine, many new ones have been added. Each head is fitted with a slotter bar independently driven by rack, giving a cutting speed that is practically constant from one end of the stroke to the other, and a quick return. Through motor and change gears the cutting and return speeds can be altered as desired. Each head is arranged for transverse planing, having a planing movement across the bed, which can be varied within desired limits and a quick return.

These movements for slotting and transverse planing make it necessary to throw out the regular driving mechanism to the table and connect it to a separate feed motion which, in this case, is entirely distinct from the regular feed motion. This throwing out of the driving mechanism, however, means simply that the pneumatic driving clutches are thrown into and left in their idle position.

The machine is fitted with its own air compressor and motor, thus making it independent of the air

The maximum distance from table to bottom of cross slide is 12 feet 2 inches, maximum stroke of table is 30 feet, maximum stroke of slotter bar is 5 feet, total width of bed is 13 feet, length of bed 60 feet, table ways 15 inches each in width, tool slides 7 feet 8 inches with 4 feet vertical traverse, cross rail is long enough to admit full traverse of either head between the posts, face of uprights 2 feet 8 inches, vertical height of cross slide, including the top rib bracing, is 5 feet.

The main driving motor is 100 horse-power, slotting and cross planing motor is 14 horse-power, lifting motor to cross slide 20 horse-power, traverse motor for heads on cross slide $7\frac{1}{2}$ horse-power, air compressor motor 14 horse-power.

The cutting and return speeds are variable through the motor, which has a 1 to $1\frac{1}{4}$ variation and further range by change gears. The cutting speeds are 14 to 22 feet and return speeds 52 $\frac{1}{2}$ to 63 $\frac{1}{2}$ feet. The same

minute, the vertical speed for raising and lowering cross slide is 24 inches per minute.

The main drive from the 100-horse-power motor is clearly shown in Figs 1 and 2, being through the gearing shown, to the pneumatic reversing clutches at the base of the upright. The speed of these clutches can be varied to some extent, as stated above, by changing the speed of the motor and a great variation obtained by the simple reversal of two change gears. The pneumatic clutches which are shown thoroughly increased are of the well-known N&P type, with a large number of friction disks whereby great friction area is obtained in a comparatively small compass. These clutches, as their name implies, are operated by compressed air. A small valve, easily moved by hand, controls the stopping, starting, and reversal of table, and handles satisfactorily the power given out by the large driving motor. In the handling of this amount of power in a motor-driven planer, it is unnecessary to state that it would be quite impossible if a belt drive was employed. From this point, on to the rack, the drive is, in practically every respect, that which is found on any planer, except, of course, in this instance it is exceptionally heavy and powerful.

It might be noted, however, that the drive is all of steel and the two ball pinions are forged directly on the shaft, being cut half pitch apart in order to

give smoothness of motion, as referred to under Fig. 4.

Among the many other new features not the least is the pneumatic feed. The feed for the cross heads is very clearly shown in Fig. 2. On the side of the upright just above the gearing, is a cylinder with piston rod extending to the left. This rod carries a rack which meshes into a gear near the bottom of the vertical feed shaft. This shaft has on its lower end a level gear meshing into another level gear on a horizontal shaft which transmits motion to the vertical feed shaft on the left-hand upright. The movement of these feed shafts is constant at all times and variation in amount and direction of head feeds is obtained by adjusting the connecting rod in the slotted cranks on the ends of the cross-shaft. These cranks are graduated in such a way that definite cross and vertical feeds can be obtained, and by using at the same time the cranks on both sides an angular feed can be given to the tool, which is at times desirable, as the whole heads were not designed to adjust. The valve for controlling the air in the feed cylinder is thrown automatically at each end of the stroke, this movement being taken from either the main driving gear train to the table or the slotter gearing, when slotting is being done. To throw out the feed, it is simply necessary to close a valve, cutting off the air supply.

In Fig. 2 the feed for the table, when slotting or transverse planing is being done, has not yet been placed in position, but it is shown in Fig. 1, directly in front of and at the base of the upright. This feed operates precisely the same as the feed for the cross head previously described, except that variation in stroke or amount of feed is obtained by an adjustable stop which regulates the amount of movement of the piston in the cylinder. This adjustment is made by the right-hand hand-wheel, the left-hand hand-wheel is for connecting and disconnecting this feed mechanism to the main driving works.

Fig. 4 shows the slotter drive, although Fig. 5 gives it in more detail.

The description of the main drive on the opposite upright fits this one up to and including the pneumatic clutches. For the table drive the power is then carried through the upright into the bed, while for

the slotter drive it is, as shown, transmitted to the vertical square shaft and thence by bevel and spur gearing to the horizontal square shaft running along the top of the cross slide. The pinion on this shaft drives the large gear, of which, however, only the cover can be seen, and the rack pinion which gears into the back of the cutter bar is on the same shaft with this gear. The pinion on the square shaft slides and can be thrown in or out of gear as desired, so that either or both bars can be used. The disk shown just above the motor contains the length of stroke. This disk is driven from the main train of slotter gearing and the adjustable stops on its periphery can be set at any desired point and effect the reversal in the same way as is done on the side of a planer table. Near the bottom of the square vertical shaft in Fig. 5 may be seen the level gear on the end of a horizontal shaft which goes across the bed and which can be connected to the mechanism operating the valve of the feed cylinder on the opposite side, as mentioned in the description of the feed for the heads.

On Figs. 1, 2, and 3 can be seen a vertical shaft whose reversing hand lever of a standard planer is usually found. It will be noticed that there are two sockets at the upper end, in one of which is a handle. The upper socket is connected to a shaft which runs down to the bottom level or crank. This is the hand control of the slotter. The method of construction can be followed quite clearly, starting as shown in Fig. 1, going through the bed and coming out on the opposite side, as shown in Fig. 6, and then by the curved connecting rod running in back of the upright and out through the upright to the slotter reversing mechanism at the reversing disk.

The lower socket is the one that controls the movement of the table when regular planing is being done and is connected by lever and rods to the reversing dogs on the bed on both sides. Only one handle is furnished for each side and this method of working from throwing the wrong lever are avoided.

owing to the great weight and large dimensions it was impossible, both from a manufacturing and a shipping standpoint, to make the bed or table in one piece. They were therefore divided to bring them within reasonable limits. The central section of the

bed is divided longitudinally into three parts, and the two end sections into two parts, or seven parts in all. The total weight of the bed is about 375,000 pounds. The table is made in two sections divided longitudinally in the center and weighs 150,000 pounds.

The holes in the table for stop bolts, etc., run entirely through the upper plate, while below this is a second plate without openings extending the full width of table for catching all chips. The chips can then be removed through the side openings of the table, which are clearly shown in Figs. 1 and 6.

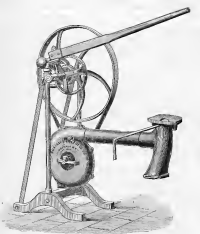
The motor for fast traverse of heads is shown on the end of the cross slide in Fig. 3. The reversing is done through friction clutches and a safety is provided which prevents throwing in the fast traverse and the feed mechanism at the same time.

The motor for operating the rail is situated at the top of the upright, as shown in Figs. 1 and 2. This motor is connected at all times to the electric wires and is stopped, started, and reversed electrically.

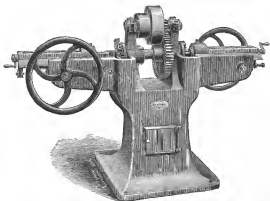
On the end of the table, in Figs. 1 and 6, are shown dashed pads over the Y and Z-ways. These are to carry the heads for truing up the ways when worn out of alignment. The method is as follows:

The table is raised say $\frac{1}{4}$ inch above the ways and supported in this position on sliding blocks fitting the upper small auxiliary shores, which are used only for this purpose. The truing heads being fastened to the end of the table, the ways are trued up from the center to the end. The heads are then placed on the opposite end of the table and the remainder of the ways finished. Near the center of the bed are pockets in the ways in which these same truing heads are placed and the table is in its turn then placed up in the same manner. The accuracy, of course, of the finished work is dependent entirely upon the accuracy of the small auxiliary ways and these are, therefore, finished and erected with great care.

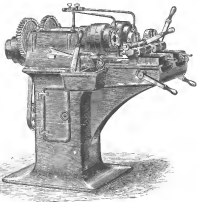
The electric wires for cross slide are firmly held top and bottom and the mat in the cross slide acts into a shouldered end in a square pocket. It is expected that this will take care of the slotter bar thrust satisfactorily, but if any loosening or trouble is experienced, arrangements have been made so that the slide can be firmly braced to the uprights.



BLACKSMITHS' HAND BLOWER.

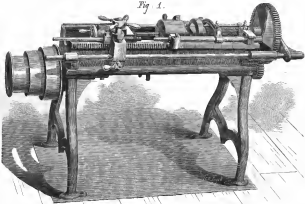


NUT AND BOLT FACING MACHINE.

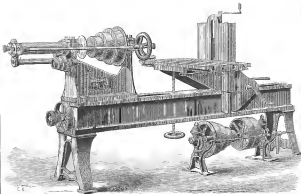


NATIONAL DOUBLE HEAD BOLT CUTTER.

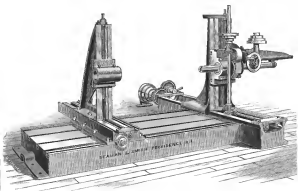
Fig. 1.



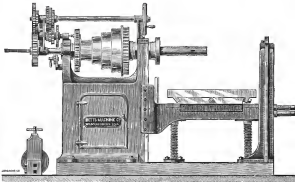
Automatic Boat Cutter



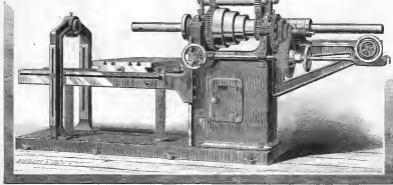
TRAVERSE DRILL AND HORIZONTAL BORING MACHINE



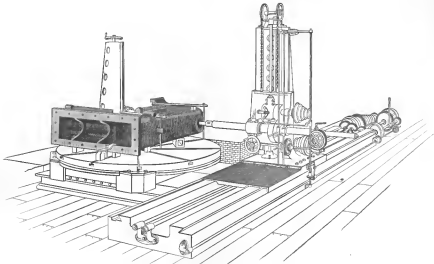
DRILLING AND BORING MACHINE.



HORIZONTAL BORING AND DRILLING MACHINE.



HORIZONTAL DRILLING AND BORING MACHINE.



BORING, DRILLING AND MILLING MACHINE—FIG. 1.

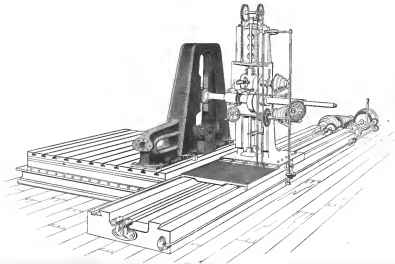


Fig. 5.

The American Builder,

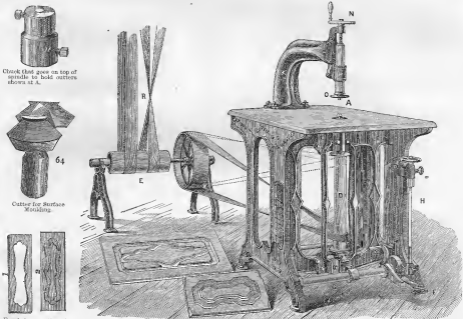
A JOURNAL OF INDUSTRIAL ART.

NEW YORK, JUNE, 1874.

AN INVALUABLE MACHINE.

The past few years have been wonderfully prolific in the production of labor-saving machinery, and the skill of American mechanics must be credited with having originated the most valuable of these improvements. Especially is this advanced

machines, collars, newel posts, stair stringers, and for cutting rosettes, and all kinds of irregular work, either on the edge or surface of lumber. In other words, the machine may be used either as a shaper, friezer, or an irregular moulding machine; as a paneler, for all designs, either plain or moulded, to be executed on the surface of the lumber in the solid wood; for routing and carving, and inlaying tracing on the surface of furniture, cars, etc; and, finally, as a dovetailer, in which capacity it does every kind of drawer work on any thickness of lumber, from one-fourth of an inch upward, cutting the two counter parts of the work at one operation. In all its applications it has a reversed motion, so that the cutting may be always done with the grain of the wood.



BOULTON'S MOULDING MACHINE AS USED FOR SURFACE MOULDING AND PANELING.

ment noticeable in the construction of wood-working tools and machinery, by the use of which the cost of production is materially lessened, the quality of the manufactures greatly improved, and the manual of the workman largely diminished. The machine which we propose to illustrate herewith has been brought out within the last four years, and is not only adapted to the general wants of the manufacturers and various workers of wood, but by its peculiar construction is adapted to specialties heretofore only done by hand. Unlike most machines adapted to an extended variety of work, Boulton's carving, paneling, moulding and dovetailing machine is not complicated, nor are the changes difficult and tedious. On the contrary, the arrangement is so simple that not five minutes time, nor the removal of more than two bolts, is necessary to effect the most radical change. It is intended to be employed in the manufacture of furniture, organs, carriages, buildings, fences, sewing

The machine, as shown in the foregoing illustration, is arranged for paneling and cutting designs on the surface. The small chuck is placed on the spindle, the penetrating cutters, like No. 64, are inserted in the chuck. The guide-head, C, is adjustable, up or down, to the work, by means of a screw and hand-wheel at N. The cutter is adjusted by the screw-rod H, to come as far above the top of the table as is desired to penetrate into the work; then by pressing the foot on the latch, X, the spindle is let down, carrying the cutter below the top of the table, out of the way.

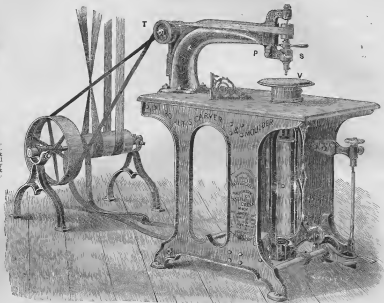
In arranging the machine for paneling on the surface, or cutting designs in the solid wood, it is first necessary to prepare a form, or template, of the work to be executed. It is made by simply sawing out the desired shape, or figure, from a straight, common board, as shown above, and according to the following rules:

As the centre of the guide-point is in line with the centre of the cutter which makes the groove, it is necessary to make the pattern, or opening, when used concentrically (or the inside) three-eighths of an inch (which is one-half the diameter of the

work limited only by the skill and taste of the operator. The largest circumference and greatest depth should be cut first, the next largest circumference and depth should succeed, and so on as far as desired.



This kind of work is moulded on the Bracket Attachment, as shown. The most delicate work of the scroll saw can be moulded by this Attachment without injury to the most delicate points.



BOULTON'S MACHINE AS USED FOR BRACKET MOULDING, INLAYING, ROUTING, GROOVING, VENEERING, &c. &c.

guide-point) larger than the centre of the groove all round. When the outer edge of the pattern is moved against the guide-point, the pattern should be three-eighths of an inch smaller than the centre of the groove, for the reason that three-eighths of an inch being half the diameter of the point, an allowance made for the same in the form will insure the work being done according to the design without irregularities.

The work, with the pattern attached, is placed on the table, the guide-point, A, is then lowered by means of the screw at N until it enters the pattern, and the pressure-plate O comes in contact with it. A sufficient amount of pressure is brought to bear to enable the operator to hold the work firmly in position. Motion being given to the spindle D, the operator then presses his foot upon the lever F, which brings the cutter up into the work, as far as previously adjusted, when the foot-plate, X, flies into the catch as the elevation is attained, and holds it there. The pattern is then moved around against the guide-point, A, until the work is complete.

The cutter being moulded, the work is finished when it leaves the machine, and as cutters for this work are made with double-cutting edges, and will work equally well when revolving in either direction, the cutting can always be done with the grain of the wood.

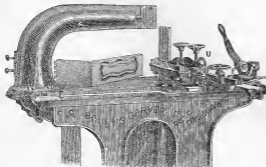
Should it be necessary to elaborate the work, it is only necessary to use successive forms, or patterns of different designs on the same panel. Each design can be cut with a different style of mould, and at a different depth, producing styles of

The above cut illustrates the machine as arranged for moulding brackets, scroll or fret work, inlaying brushes, engraving, routing, grounding, and for doing fine moulding of every description. This arrangement consists of a spindle-head P, placed on the arm as shown, and driven by the belt passing from the countershaft over the friction pulleys T, on to the pulley on small spindle. It is only necessary, when arranging the machine for this work, to take off the belt from the large pulley and put on a light belt running to the top spindle. This spindle is moved up or down by means of a pin inserted in the brass box, and working in a cam slot in the head. The handle attached to the box is brought around, causing the pin to move up in the slot, carrying with it the spindle. This arrangement is especially convenient in moulding scroll work, as it enables the operator to get at the inside openings. After the work is in position, the cutter is lowered into the opening by the same means that it was raised. When the work is finished, the spindle is again raised, and another opening is brought into position, and so on until the work is finished, all of which is done without stopping the motion of the machine. The cutters are made with a guide-point, which can be very much reduced in size, and will follow the smallest opening of a scroll-saw. No forms or patterns are necessary. The small table V, shown as setting on the machine, and upon which the work is laid, is adjustable up or down, by turning the top around, causing it to rise or fall as may be necessary to accommodate the different thicknesses of stuff to

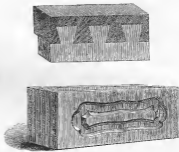
be worked. By this arrangement stuff may be worked from 3-16 to 2 inches in thickness. The same cutters can be used on the lower spindle if thick stuff is to be worked.

To do inlaying, a thin form or pattern is used of the desired shape, affixed to the work. A small router is used, having a shank equal in size, which is used as a bearing, or guide, for

In the Dovetail Attachment we have a simple and perfect arrangement for making a strong, beautiful, "honest" dovetail on any kind or thickness of lumber, and perfectly adapted to all the requirements for such work, cutting both parts (side and front) at the same time. If the drawers are narrow, two sides and two fronts can be cut at the same time, and the work



DOULT'S PATENT MOULDING MACHINE WITH DOVETAILING ATTACHMENT, SHOWING SAMPLES OF WORK.



the pattern, which being on the top of the work, the cutter is let down through the pattern into the work the desired depth.

The lower end of the main spindle runs upon a tempered steel screw. The end of the spindle is also tempered, and is made tapering, and fitted to a brass bush, which is set in the lower box a little above the end of the spindle, thus forming an oil-box, or chamber, at the extreme end of the spindle, where the two steel points come together. The oil passes directly to the chamber through a tube on the outside. The object of the taper fit of spindle and brass box is to prevent side, or lateral motion from wear of the parts. Whenever such motion occurs

is done with dispatch and with scrupulous exactness. The bed-plate clamps on the left-hand side of the top of the machine, and is placed (by set-screw on the under side) so that the cutter B will enter equidistant between the fingers C of the carriage as it is moved up. Adjustable stops are placed on this bed-plate—before and behind the slide—to regulate the stroke. A front and side of a drawer, or two of each, if narrow, may be cut at the same time. The ends J are placed upon the fingers C, and held by lateral compression screws. The fronts are placed horizontally in the bottom of the carriage, and held by vertical compression screw H. Adjusters, E, are



SPECIMENS OF PANELS CUT BY DOULT'S MOULDING AND PANELING MACHINE.

the box should be raised by loosening the set bolts by which it is held on to the slide, which will allow the box to be raised until there is no lateral motion. It may be necessary to lower the step-screw as much as the box is raised. This necessity can be ascertained by observing the adjustment of the spindle endwise. The construction of this part of the machine is such that the step may always be kept in perfect order.

provided at each side of the carriage to regulate the position of the lumber, and give the desired relief. The plan of the dovetailing being to make each part (pin and mortise) both at the same time and equal in size (both being of the same size as the cutter). In order to accomplish this, the cutter must be set to work up into the lumber about 1-2 of an inch, (that being the dividing line of the cutter,) which makes the pin and

mortise equal. A slight variation of the cutter, up or down, makes the fit tight or loose, as desired. The relish may be regulated as desired, by the position of the adjusters. The slip-pin in the adjusters can be regulated to make side and front come even on the edge. The adjustment for cutting the backs is effected by placing in position a drawer side, after having been cut to match the front, the same as when cut, then place the pieces for back in position, letting the edge come even with the lower corners of the outside, or first pin on the drawer side, then slip the adjusting slip-pin up to the edge of the back, when the machine is ready for work.

The cutting should commence when the latch is in the second notch from the end of the spacer. In all cases, both parts which serve to form a corner are cut at the same time. When once adjusted, the slip-pins may be marked so as to readily set the machine for cutting either fronts or backs, with the corresponding sides, in a few moments.

With the right hand on lever A, and left hand on hand-wheel G, the operator has control of carriage. With right hand move it forward, and with the left hand move it laterally. As the carriage moves backward, the dog M lifts the latch F long enough to allow the carriage to pass, when it drops and catches into the next notch, and holds it until another pin and mortise are cut.

We have devoted this much space to the description of this machine because we regard it as the simplest, most useful and cheapest machine ever produced for general wood-work. For fuller information, address Battle Creek Machinery Company, Battle Creek, Michigan.



Brush of WIRE and Hair-tooled BRISTLES. They follow the scalp and promote better circulation. Superior to all other hair brushes in the world, and Made of Pure Cellulose. If You Have Dandruff a WIRE BRISTLE is an ABSOLUTE Hair Dress, Nothing It Was This One, You Shall Soon Invented Light.

DR. SCOTT'S ELECTRIC HAIR BRUSH.

A MARVELLOUS SUCCESS!!

USE RECOMMENDED BY ALL GREAT PHYSICIANS.



Made of Pure Bristles, not Wire—elegantly Mounted and Curved Back.

Directions
 Wash your hair with soap and water, then dry it. Then use the brush in the following manner: Hold the brush in your right hand, and with the left hand, draw the hair down to the neck. Then brush the hair from the crown of the head to the temples, and from the temples to the ears. Repeat this process several times. The brush should be used every day, and will keep the hair clean, soft, and free from dandruff. It will also promote the growth of the hair, and prevent it from falling out. The brush is made of pure bristles, and is not made of wire. It is a marvelous success, and is recommended by all great physicians.

IT IS WARRANTED TO
 Give Superior Results in 3 Months!!
 Cure Itching Scalps in 3 Months!!
 Cure Dandruff in 3 Months!!
 Give Soft and Silky Hair and Condition!!
 Cure Headache and Irritation of the Scalp!!
 Promptly Remove Premature Grey Hair!!
 Make the Hair grow longer and thicker!!
 Instantly Restore the Hair after it has been removed!!
 If not so represented it will be a great brush simply does otherwise.

It is very difficult to produce a rapid growth of hair on bald heads, when the glands and follicles are not totally destroyed.

Prove this for the first time in the world. See the results in the following cases. See each case carefully.

[See Dr. Boyer of Chicago.]

I have used your brush for several months, and I can say that it has done more for my hair than any other brush I have ever used. It has made my hair soft and silky, and it has prevented it from falling out. I have also noticed that my hair is growing much longer and thicker than it was before. I am very much pleased with the results, and I can recommend your brush to all who are troubled with dandruff, itching scalps, or thinning hair.

"I would Not take \$1,000 for my Brush"

Dr. J. C. Boyer, Chicago, Ill. I have used your brush for several months, and I can say that it has done more for my hair than any other brush I have ever used. It has made my hair soft and silky, and it has prevented it from falling out. I have also noticed that my hair is growing much longer and thicker than it was before. I am very much pleased with the results, and I can recommend your brush to all who are troubled with dandruff, itching scalps, or thinning hair.

ASK FOR DR. SCOTT'S HAIR BRUSH. MADE IN AMERICA.
 See that you get the real one.

A BEAUTIFUL BRUSH, LASTING 10 YEARS.

We will send it on trial, except an order of \$10.00, which will be returned if not so successful.

Write for a free trial, and we will send you a beautiful brush, and a bottle of Scott's Hair Dressing, and a bottle of Scott's Hair Oil, all for the price of the brush. Write to Dr. J. C. Scott, 100 North Dearborn Street, Chicago, Ill.

NOT RETURNED IF NOT AS REPRESENTED.

Write for a free trial, and we will send you a beautiful brush, and a bottle of Scott's Hair Dressing, and a bottle of Scott's Hair Oil, all for the price of the brush. Write to Dr. J. C. Scott, 100 North Dearborn Street, Chicago, Ill.

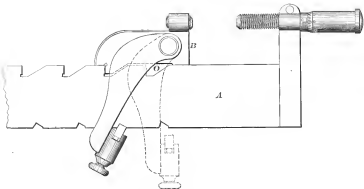
Write for a free trial, and we will send you a beautiful brush, and a bottle of Scott's Hair Dressing, and a bottle of Scott's Hair Oil, all for the price of the brush. Write to Dr. J. C. Scott, 100 North Dearborn Street, Chicago, Ill.

Write for a free trial, and we will send you a beautiful brush, and a bottle of Scott's Hair Dressing, and a bottle of Scott's Hair Oil, all for the price of the brush. Write to Dr. J. C. Scott, 100 North Dearborn Street, Chicago, Ill.

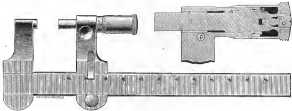
Match this Page.

Write for a free trial, and we will send you a beautiful brush, and a bottle of Scott's Hair Dressing, and a bottle of Scott's Hair Oil, all for the price of the brush. Write to Dr. J. C. Scott, 100 North Dearborn Street, Chicago, Ill.

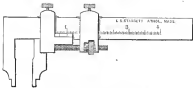
Write for a free trial, and we will send you a beautiful brush, and a bottle of Scott's Hair Dressing, and a bottle of Scott's Hair Oil, all for the price of the brush. Write to Dr. J. C. Scott, 100 North Dearborn Street, Chicago, Ill.



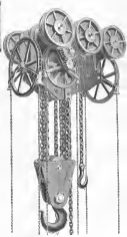
RICHARDS' MICROMETER GAUGE.



A BEAM MICROMETER CALIPER.



MICROMETER GAUGE SQUARE



LARGE HOIST MACHINE

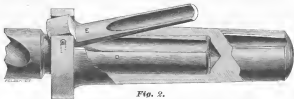


Fig. 2.



Fig. 1.



Fig. 3.



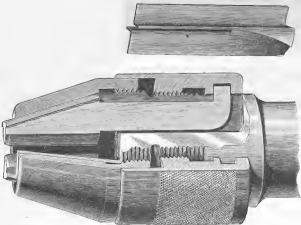
Fig. 4.

A New Drill Cutter.



THE
HARTFORD

HARTFORD DRILL CHUCK.



DRILL CHUCK AND REDUCER.



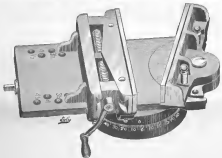
ADJUSTABLE BLOCK AND DIES.



ADJUSTABLE CHUCK



FIG. 3



PLANNER CHOCK.



Fig. 3.



Fig. 1.



Fig. 4.



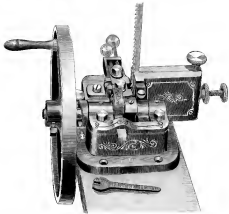
Fig. 2.



Fig. 5.



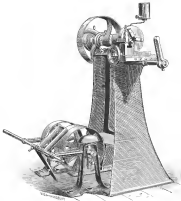
WATSON'S GEARED SCROLL CHUCK.



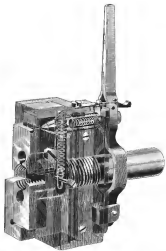
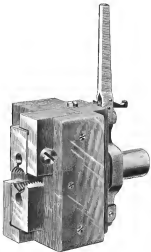
PATENT BAND-SAW SETTING MACHINE.

Fig. 1

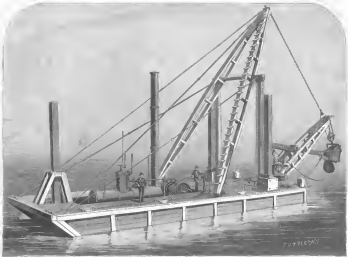




NEW CUTTING-OFF MACHINE.



THE GARDNER DIE HEAD.



CRANE & TOWER ON A BARGE, CHESAPEAKE MARSHES AT OXFORD

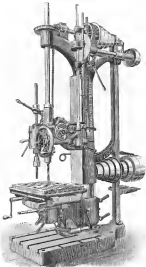


Fig. 1.

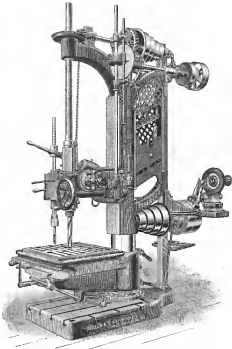
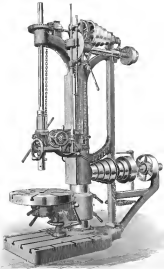


Fig. 2.



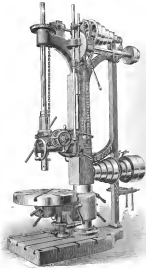
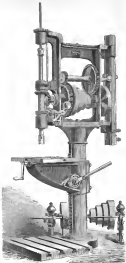
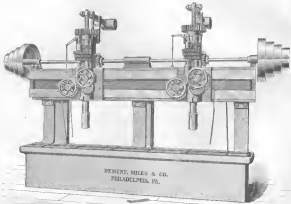


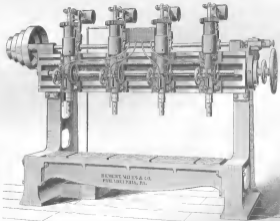
Fig. 4.



COMBINED PUMP AND BOILER.

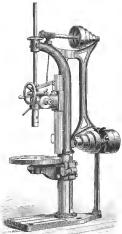


Two models for reference machine

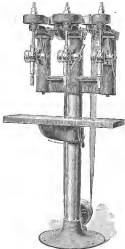


HEWITT, MERRILL & CO.
PHILADELPHIA, PA.

HEWITT, MERRILL & CO. MANGLE

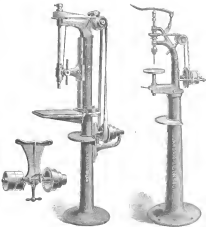


New M. DANA.

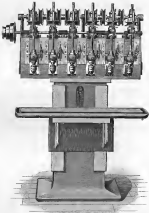


THREE-SPINDLE DRILL PRESS.

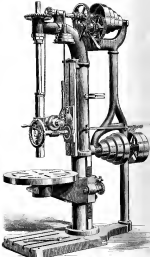




THE "GARDNER" DRILL PRESS.



SCREW-FEED DRILL



The Great Old Scale

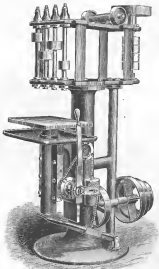


A New Light Drill Press.

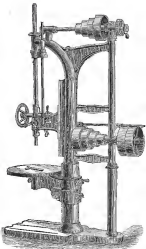


FIG. 81.

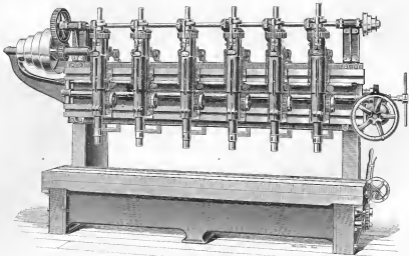
FRANCIS DAVENANT DALLA PIANA.



FOUR-SPINDLE DRILL PRESS.

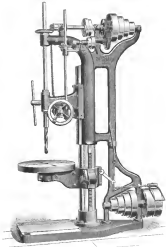


DOUBLE COLUMN DRILL.

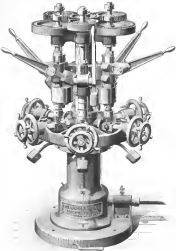


SIX-SPINDLE GANG DRILL.



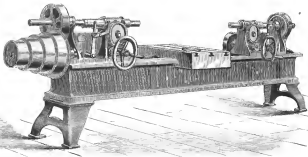


TWENTY INCH DRILL PRESS



MULTIPLE BEAM STEAM ENGINE



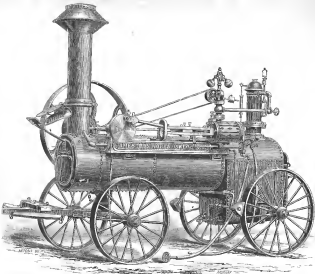


NEW TRAYLER DRILL.

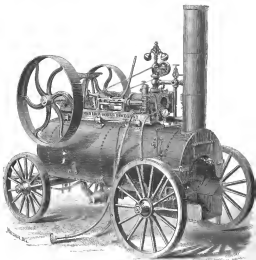


THE AMERICAN DUCK HANGER.

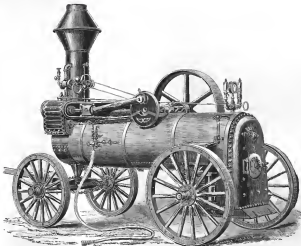




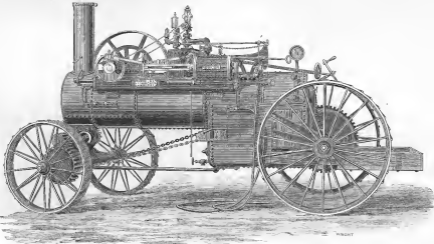
IMPROVED THRESHING ENGINE.



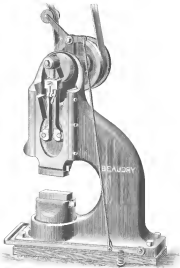
STEAM TRACTION ENGINE



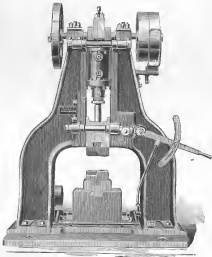
ITHACA PORTABLE ENGINE.



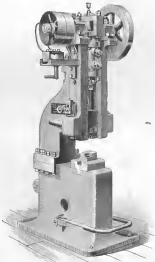
NEW TRACTION ENGINE.



A NEW POWER HAMMER.

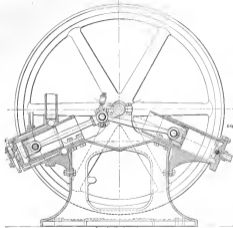


300 POUND HACKNEY HAMMER.



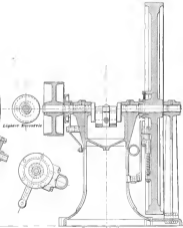
50 POUND HACKITT HAMMER

W. H. & C. S. G. Co.
WOOD-BORING MACHINERY
ROCHESTER, N. Y.
1888.



Exploded Section

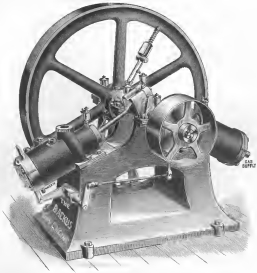
Fig. 1.

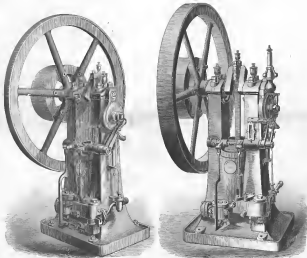


Front View Section

Fig. 2.

THE BARKER GAS ENGINE.





NEW DESIGN OF KORTING GAS ENGINE.

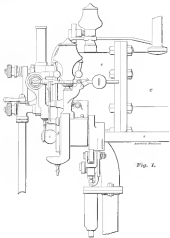


Fig. 1.

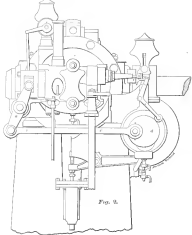
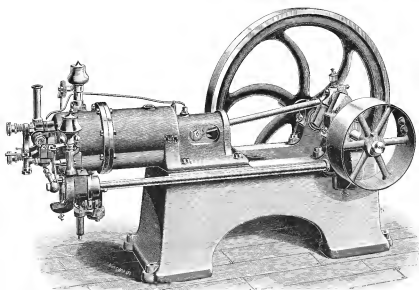
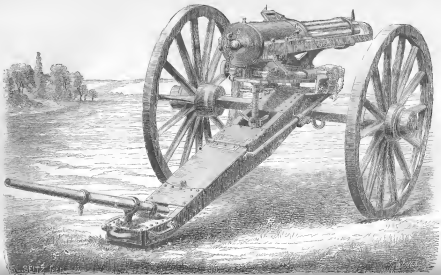
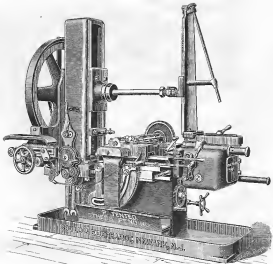


Fig. 2.

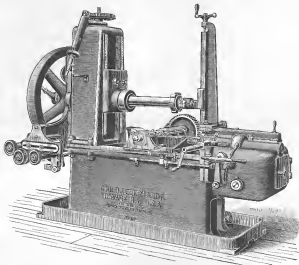




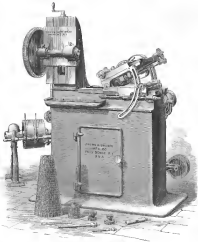
THE GATLING GUN



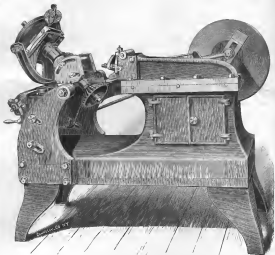
AUTOMATIC GEAR CUTTER.



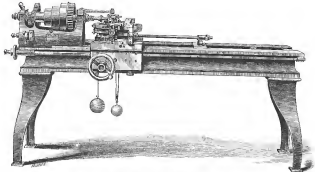
IMPROVED AUTOMATIC GEAR CUTTER.



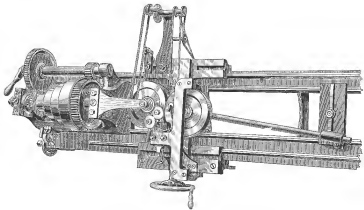
AUTOMATIC GEAR CUTTING MACHINE



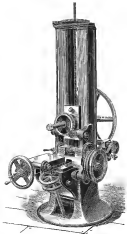
DE LORM'S ROYAL GEAR CUTTER.



EPICYCLOIDAL ENGINE.—SIDE VIEW.



EPICYCLOIDAL ENGINE.—TOP VIEW.



NEW GEAR CUTTER.

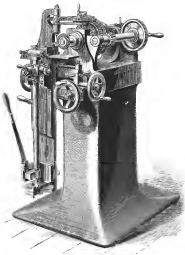


FIG. 11. PHOTOGRAPHIC GRAN CUTTER ENGINE.

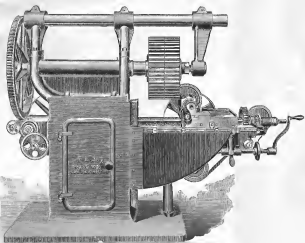
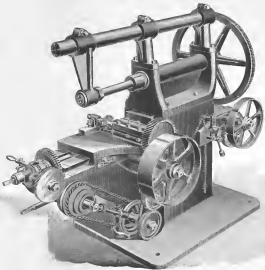
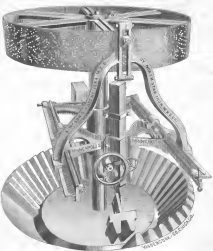


Illustration of a vintage mechanical mangle or laundry press.





SHAW-WALKER TYPE-SETTING MACHINE

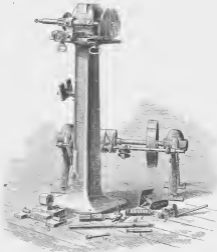
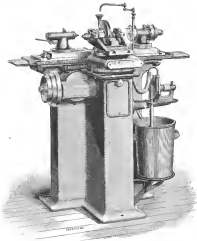
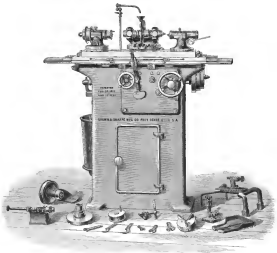
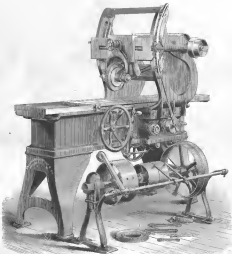


FIG. 1.—Foot-Gearless Machine.

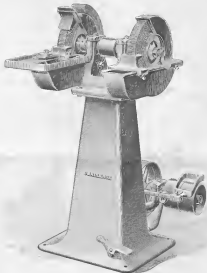




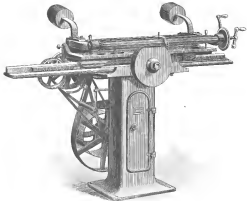
UNIVERSAL GRINDING MACHINE—REAR AND FRONT VIEWS.



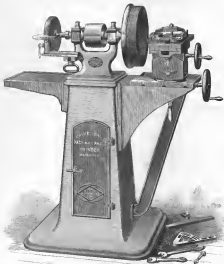
THE BROWN & SHARPE SURFACE GRINDING MACHINE.



SINGER



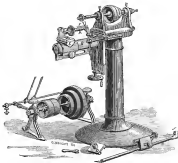
AUTOMATIC SURFACE GRINDING MACHINE.



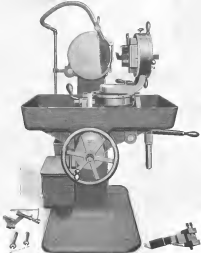
UNIVERSAL FACE AND ANGLE GRINDER.



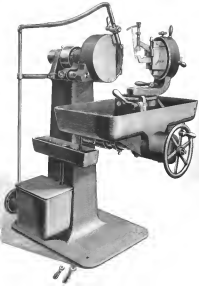
SPECIAL AUTOMATIC GRINDER.

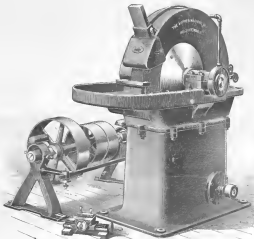


NEW COPPER GRINDING MACHINE.

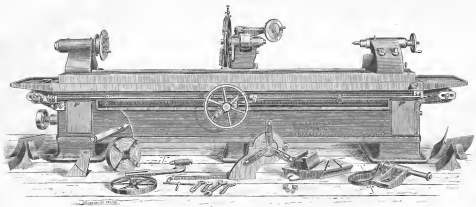


Hand Press for Metal Work.

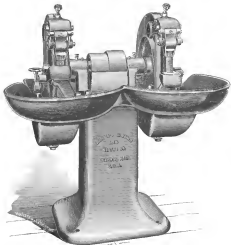




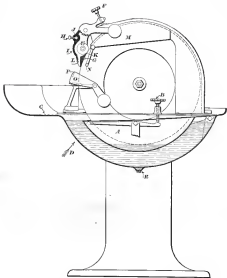
THIRTY-SIX INCH TOOL GRINDER.



UNIVERSAL GRINDER.



A NEW TOOL GRINDER.





**AUTOMATIC TWIST DRILL-GRINDING MA-
CHINE.**

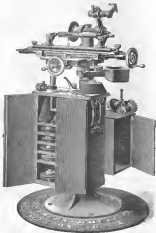
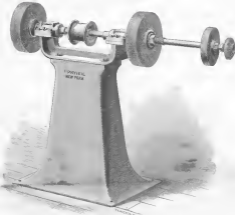
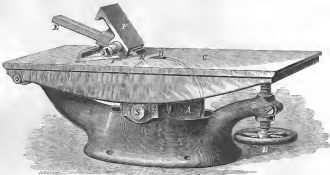


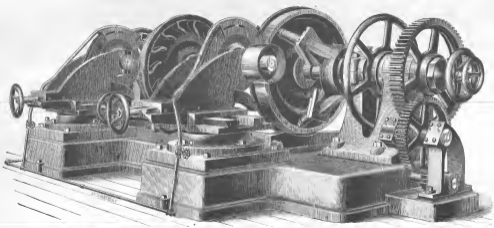
Fig. 57.



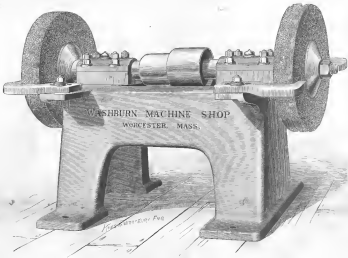
SEWING MACHINE



SURFACE GRINDING MACHINE.

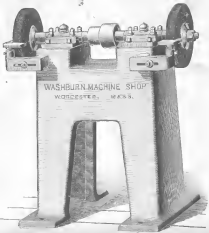


CHILLED CAR WHEEL GRINDER.

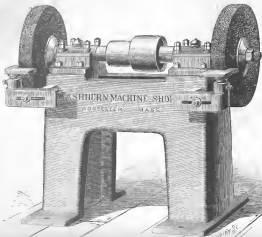


WASHBURN MACHINE SHOP
WORCESTER, MASS.

TWO-INCH STANDARD MACHINE.

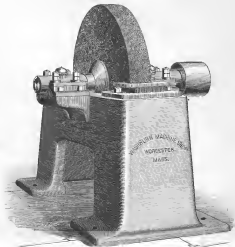


WASHBURN MACHINE SHOP
WORCESTER, MASS. U.S.A.

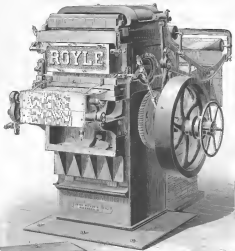


ASHBURN MACHINE SHOP
WORCESTER MASS.

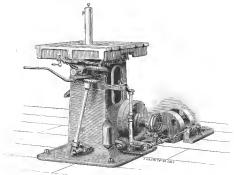
1880

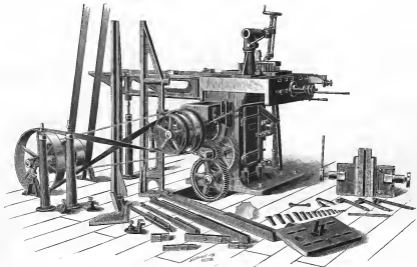


SINGLE WHEEL EMERY MACHINE.

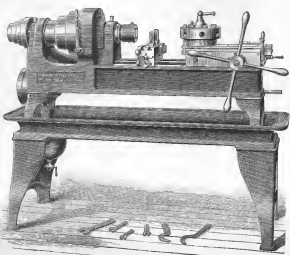


IMPROVED AUTOMATIC JACQUARD CARD REPEATER.

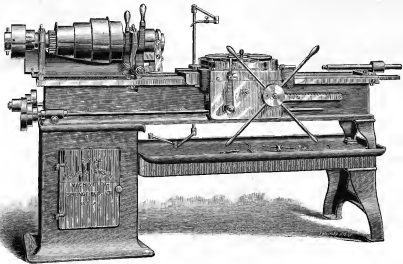


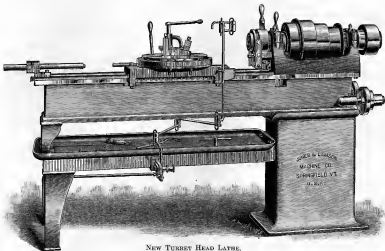


KIRTLEY'S PATENT
RAIL-CUTTING MACHINE.

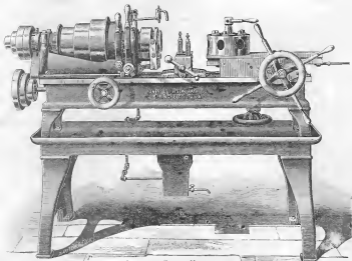


A NEW SCREW MACHINE.

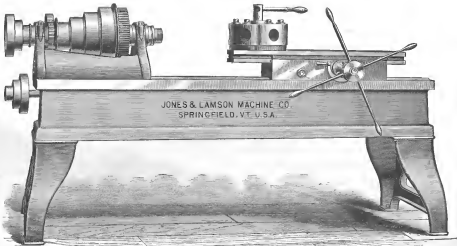




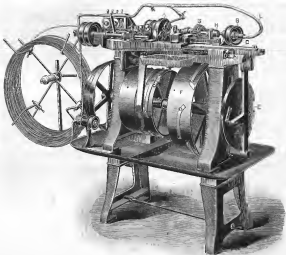
NEW TURRET HEAD LATHE.



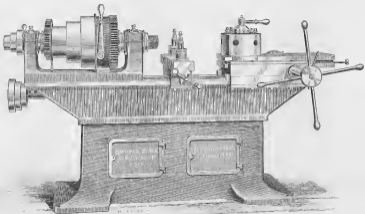
IMPROVED SCREW MACHINE.



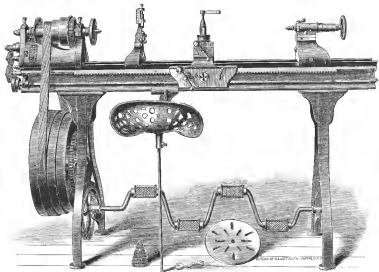
A NEW CHUCKING LATHE.



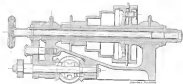
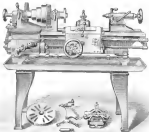
A NEW AUTOMATIC SCREW MACHINE.—FIG. 1.



IMPROVED SCREW MACHINE

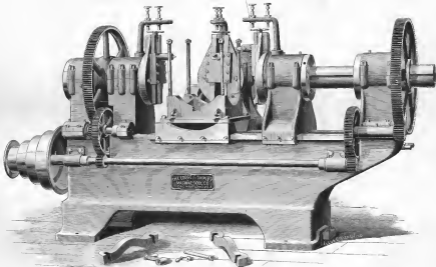


BARNES' VELOCIPED LATHE.—SEE PAGE 4.

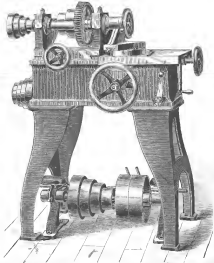


End View of Heavy Duty Lathe

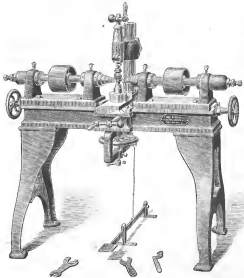
HENRY NORTON LATHE WITH DRAW CRACK



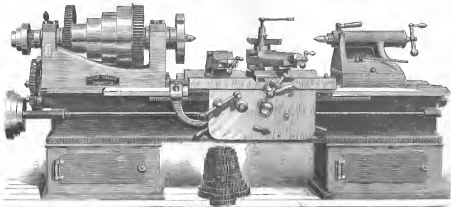
TAPPAN FACING MACHINE.



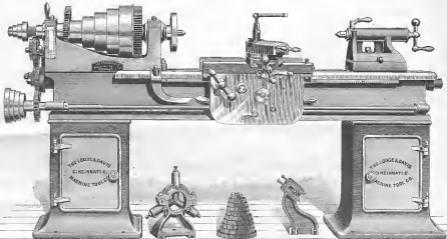
MACHINE FOR TURNING RINGS OF HAND WHISTLES.

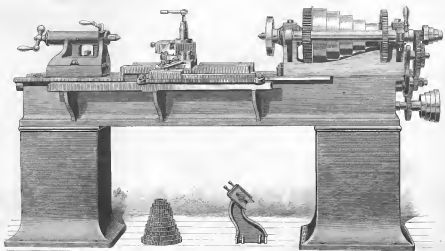


IMPROVED VALVE MILLING MACHINE.

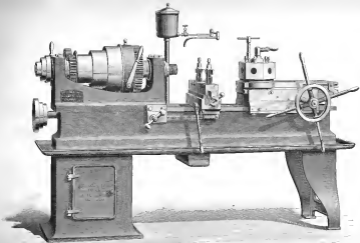


NEW HEAVY LATHE.

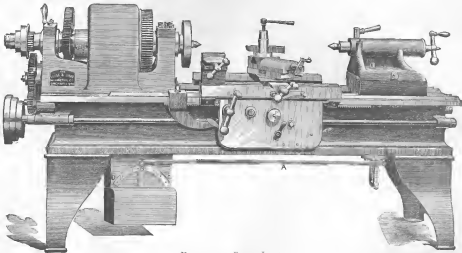




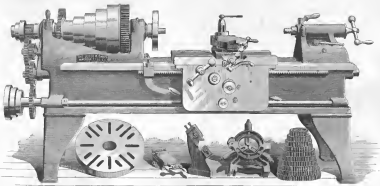
SIXTEEN-INCH TOOL-ROOM LATHE.



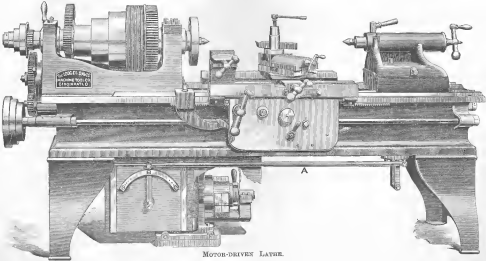
SCREW MACHINE



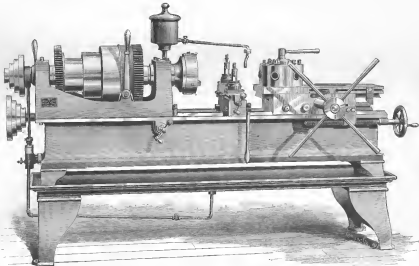
MOTOR DRIVEN ENGINE LATHE.



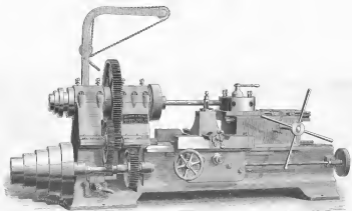
Twentieth Century Lathe



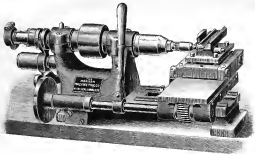
MOTOR-DRIVEN LATHES.



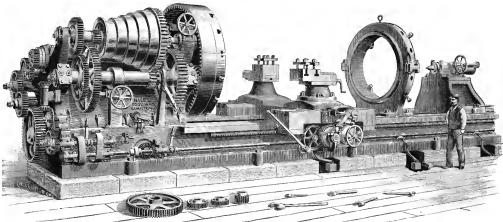
80x25 AND 20x12 INCH SCREW MACHINE.



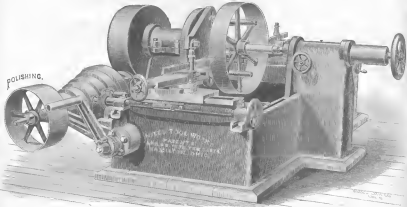
THREE-SPINDLE TOOL LATHE



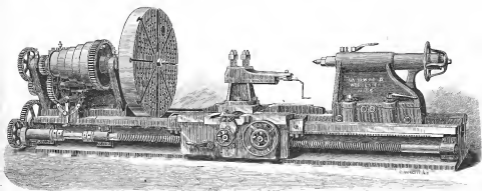
HENSCH FORMING LATHE.



NINETY-INCH FORGE LATHE.



NEW DESIGN OF POLISHING MACHINES.—(For description see page 2).



NEW ENGINE LATHE.—SIXTY INCH SWISS.

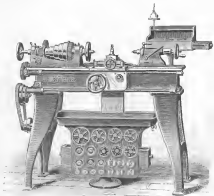
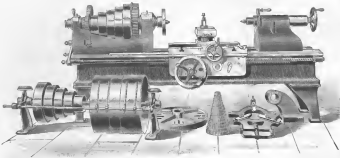
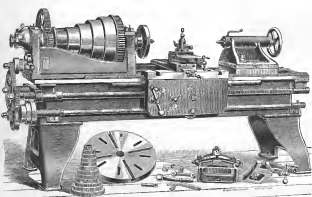


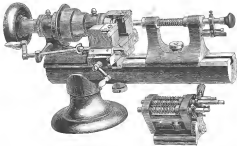
Fig. 75.—A TOOL MAKER'S LATHE.



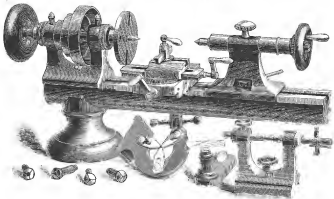
New 27 Inch Lathe.



TWENTY-TWO-INCH ENGINE LATHE.



NO. 2. SAWYER LATHE.



NO. 2 1/2 SAWTER LATHE.



Fig. 1.



Fig. 2.

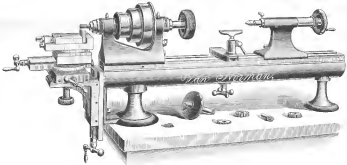


Fig. 3.

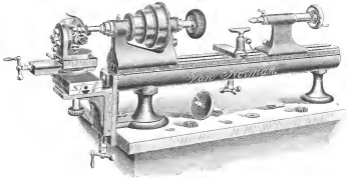
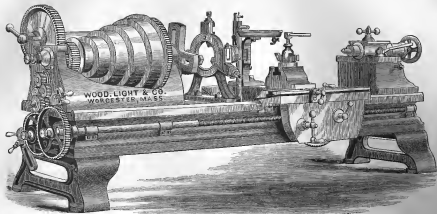


Fig. 4.

THE VAN NORMAN BENCH LATHE.



IMPROVED PATENT AXLE LATHE.



SCREW CUTTING FOOT LATHE.







THE BERLIN IRON BRIDGE CO.

MANUFACTURERS OF ALL KINDS OF IRON BRIDGES, GIRDERS, AND STRUCTURES.

BRIDGE ENGINEERS AND ARCHITECTS.

BRIDGE ENGINEERS AND ARCHITECTS.

BRIDGE ENGINEERS AND ARCHITECTS.

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BRIDGE ENGINEERS AND ARCHITECTS.



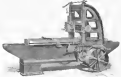
















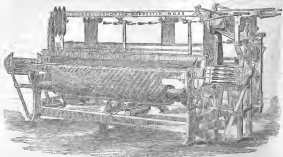




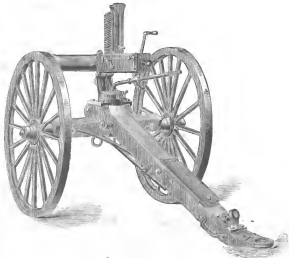




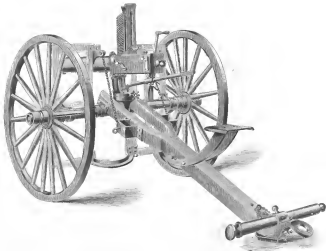




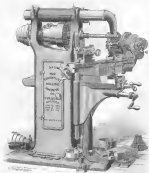
IMPROVED FANCY LOOM—HORIZONTAL HARNESS MOTION.



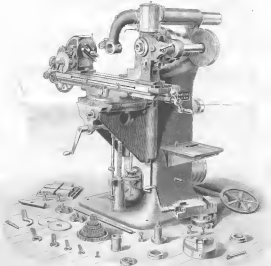
IMPROVED GARDNER MACHINE GIVE MOUNTED ON ARMY CARRIAGE.



IMPROVED GARDNER MACHINE GUN MOUNTED ON HEAVY CARRIAGE.



THE
SINGER
SEWING MACHINE
CO.
NEW YORK



A NEW UNIVERSAL MILDING MACHINE.

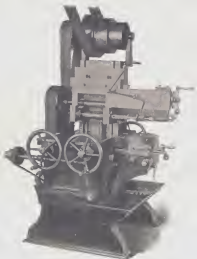
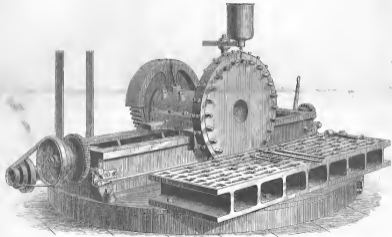
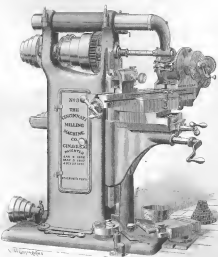


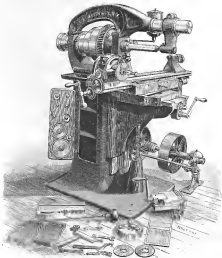
Fig. 1.
MILLING MACHINE BUILT IN '52.



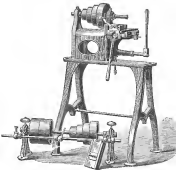
BEAUMONT'S ROTARY ENGINE



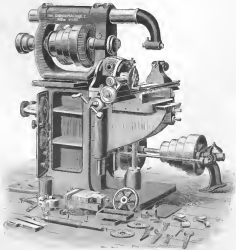
UNIVERSAL MILLING MACHINE



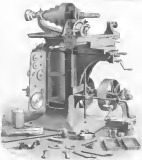
UNIVERSAL MILLING MACHINE.



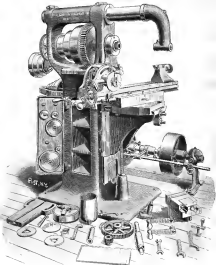
NEW MILLING AND SCREW SLOTTING MACHINE.



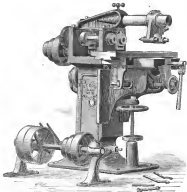
UNIVERSAL MILLING MACHINE.



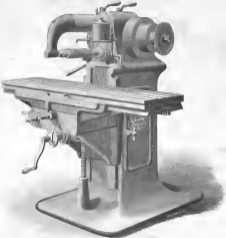
1 STEAM-ENGINE WORKING MACHINE.



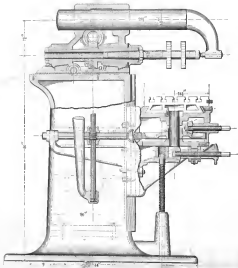
UNIVERSAL MILLING MACHINE.

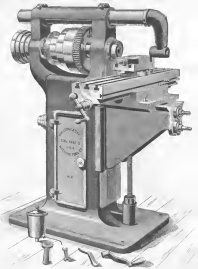


GARTON'S TWO-SPINDLE MILLING MACHINE.



GRANT PUMP MOUNTED MACHINE.





PLANIMETER

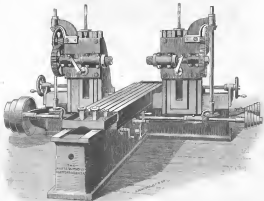


Fig. 76.—HEAVY MILLING MACHINE.

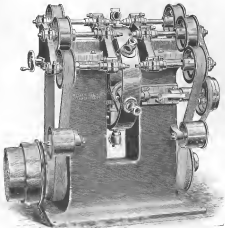
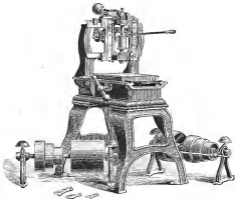
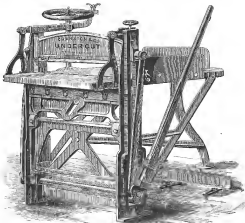


Fig. 78.

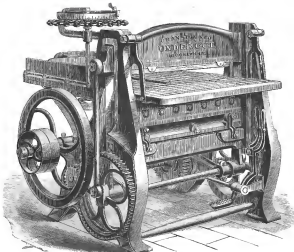
VALVE MILLING MACHINE.



NEW PROFILE OR EDGING MACHINE.



"UNDERCUT" HAND-LEVER PAPER CUTTER



UNIVERSITY POWER PAPER CUTTER.

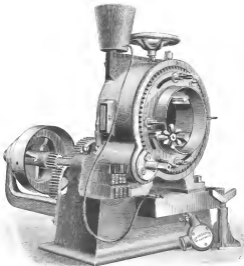
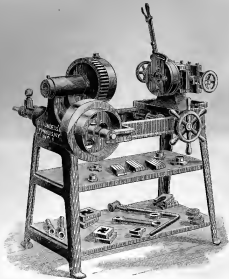
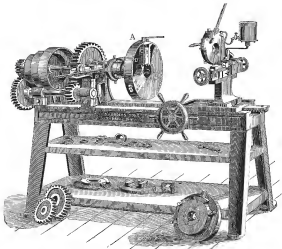


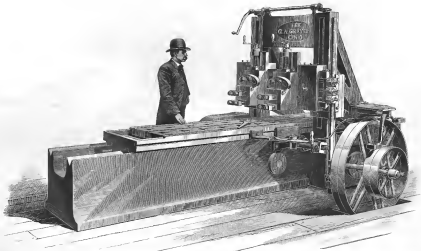
FIG. 4. RUBBER MANGLE.



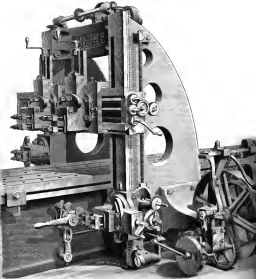
POWER PIPE-CUTTING AND THREADING MACHINE.



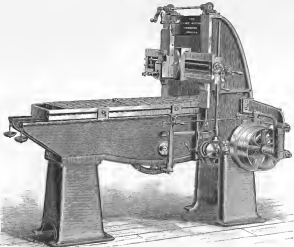
PIPE THREADING AND CUTTING MACHINE.



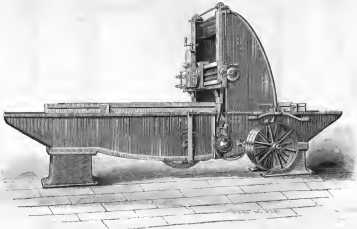
NEW RAILROAD IRON PLATER



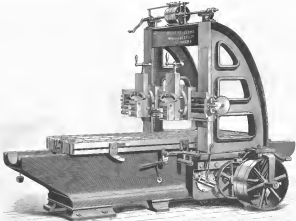
WALTON & BROS. MACHINERY



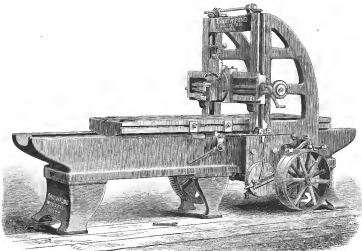
SIXTEEN-INCH PLANER.—SEE PAGE 4.



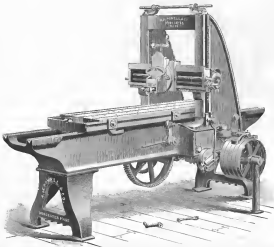
TWENTY-SEVEN INCH PLANER.



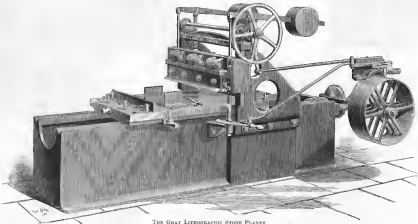
THE RUBBER PRESS



POND'S NEW IRON PLANER.



POWELL'S IRON PLANER.



THE GREAT LITHOGRAPHIC STONE PLASER.



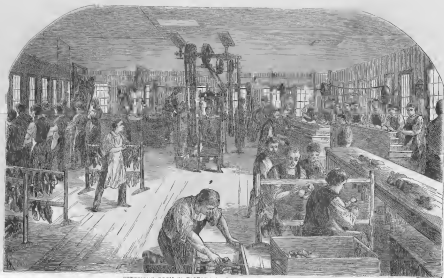
TACK MANUFACTORY OF A. FIELD & SONS, TUNISON, MISS.



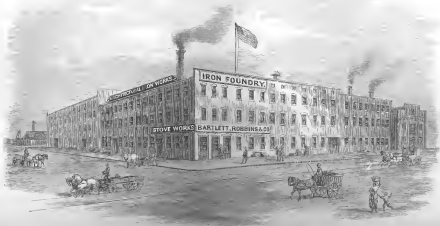
SCREW WRENCH MANUFACTORY A. G. COOK & CO. WORCESTER, MASS.



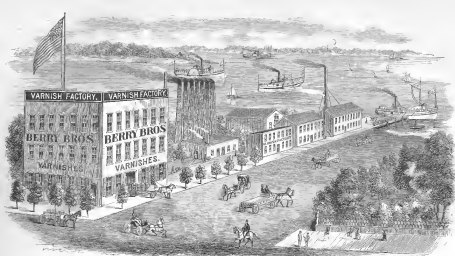
WAREHOUSES OF ALBERT F. ALLEN, PROVIDENCE, R. I.



BOTTOMING ROOM IN FACTORY OF B. F. SPINNEY & CO., LYNN, MASS.

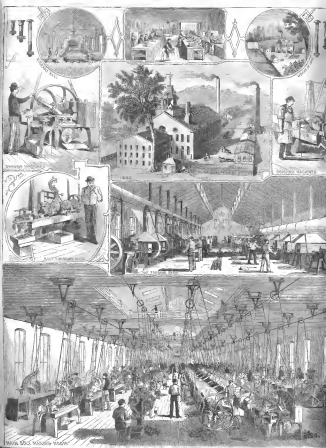


BARTLETT, ROBBINS & CO'S ARCHITECTURAL IRON WORKS, BALTIMORE, MD.



MANUFACTORY AND WAREHOUSES OF BERRY BROS., DETROIT, MICH.

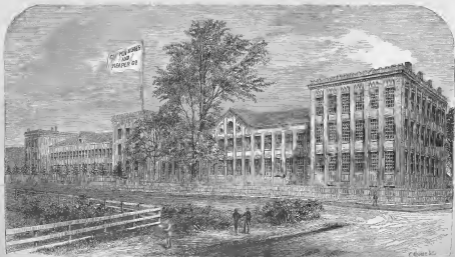
1896 GETTWAY



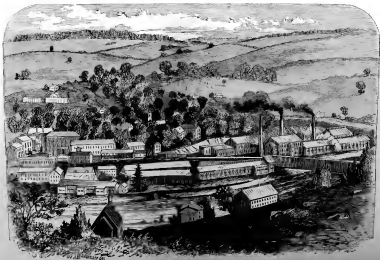
Spinning Mangle

Power Loom

Wool Card, Mangle, & Press



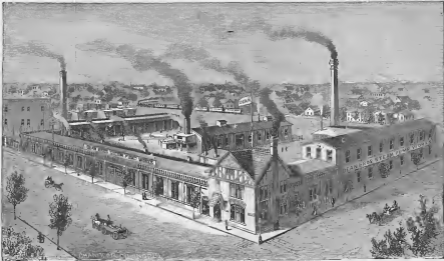
WORKS OF THE CLIPPER MOWER AND REAPER COMPANY, YONKERS, N. Y.



COLLINS & CO'S WORKS, COLLINSVILLE, CONN.



CROMPTON LOOM WORKS, WORCESTER, MASS.



NEW BRIDGE OF DEAN BISS. STEAM PUMP WORKS.

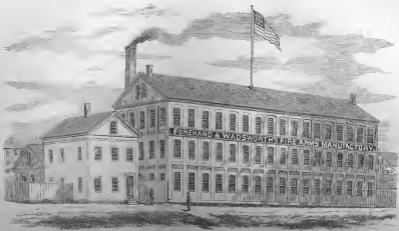


KEYSTONE SAW WORKS, HENRY DISTON & SON, PHILADELPHIA.





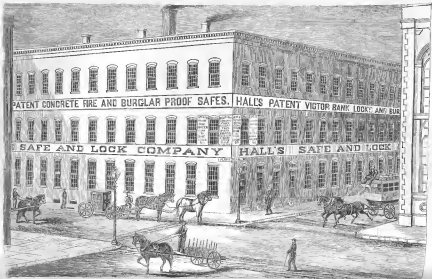
WORKS OF THE FARRELL FOUNDRY AND MACHINE COMPANY, ANDOVER, CONN.



FIRE ARMS MANUFACTORY OLIN & WADSWORTH WORCESTER, MASS.



GEORGE W. CLUETT, BROTHER & CO'S LINEN COLLAR MANUFACTORY, TROY, N. Y.



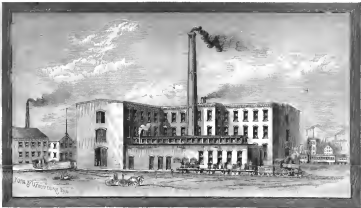
PATENT CONCRETE FIRE AND BURGLAR PROOF SAFES.

HALL'S PATENT VICTOR BANK LOCKS AND BUR

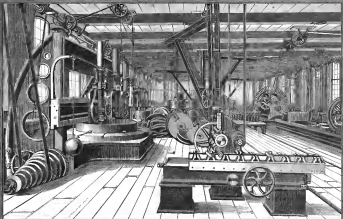
SAFE AND LOCK COMPANY

HALL'S SAFE AND LOCK

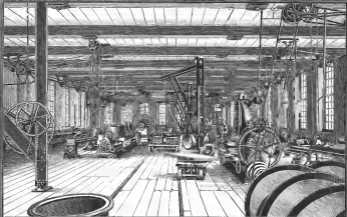
MANUFACTORY OF HALL'S SAFE AND LOCK COMPANY, CINCINNATI



THE HOLYOKE MACHINE CO'S NEW SHOPS AT WORCESTER.—REAR VIEW.



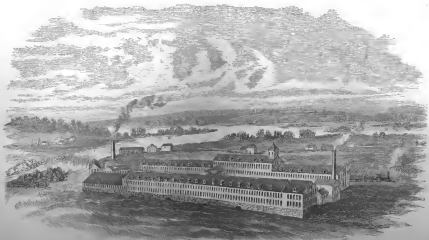
INTERIOR VIEW OF SHOP—FIRST FLOOR LOOKING FROM STREET ENTRANCE.



INTERIOR VIEW OF SHOP; LOOKING TOWARD THOMAS STREET.



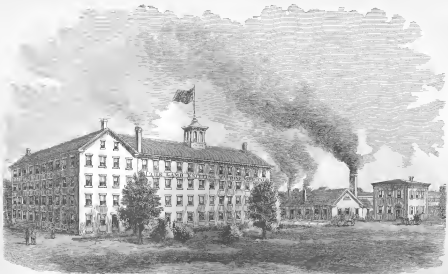
JACKSON & SHARP CO. CAR WORKS, WILMINGTON, DEL.



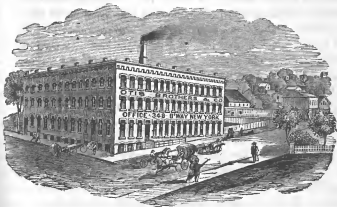
JOHN RUSSELL MANUFACTURING COMPANY GREEN RIVER WORKS MASS



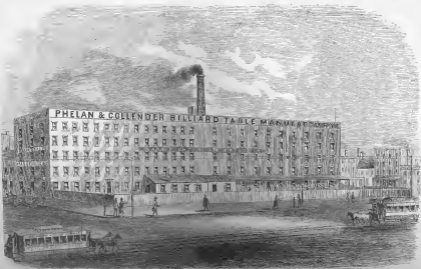
STRAUBER & FOOT CO., FINE LIGHTS, 101 Columbus St., N. Y.
MANUFACTURERS OF SPECIAL LIGHTING SYSTEMS.



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MANUFACTORY OF HOISTING MACHINERY, YONKERS, N. Y.



PHELAN AND COLLENDER'S WORKS, TENTH AVENUE, NEW YORK.



A. S. PUTNEY & CO'S WORKS, NEPONSET, MASS.

R. HOE & Co.,

MANUFACTURERS OF

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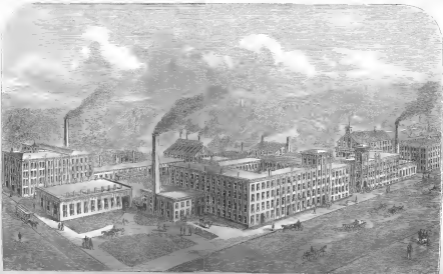
CAST STEEL, CIRCULAR, MILL, PIT AND CROSS CUT SAWS, &c. ALWAYS ON HAND.

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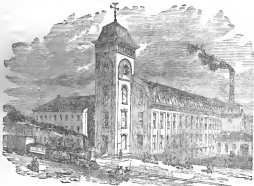


W. B. Woodbury del. J. B. Knapp sculp. 1853

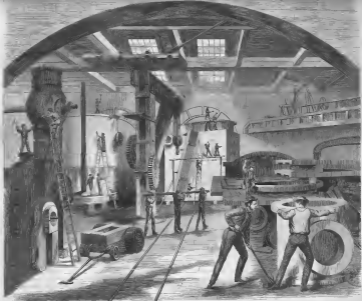
MANUFACTORY OF RAY & TAYLOR, SPRINGFIELD, MASS.



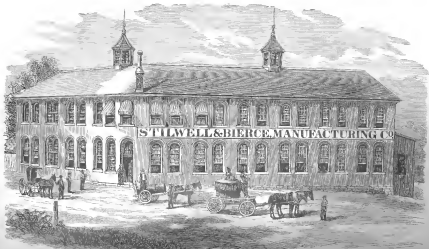
REMINGTON'S ARMS, ILION, N. Y.



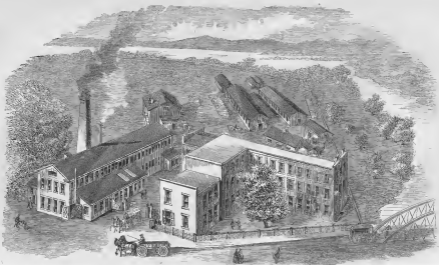
WORKS OF THE SARGENT CARD CLOTHING COMPANY, WORCESTER, MASS.



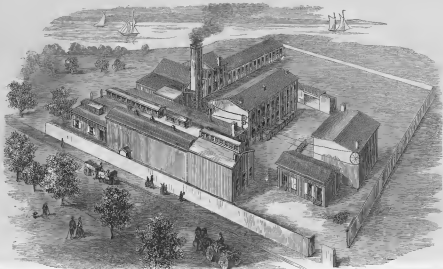
VIEW OF SHOPS FOR THE MANUFACTURE OF LARGE ENGINES



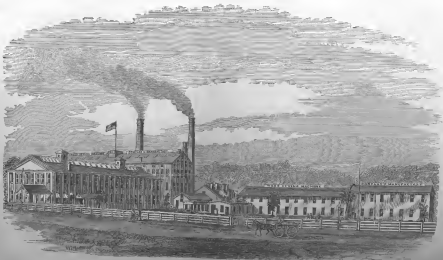
WORKS OF THE STILWELL & BIERCE MANUFACTURING COMPANY, DAYTON, OHIO



FACTORY OF THE SWIFT & COURTHY & BEECHER CO AT WESTVILLE, CONN



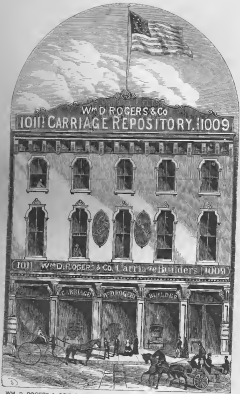
FACTORY OF THE SWIFT & COURTHY & BUCHER CO., AT WILMINGTON, DEL.



MANUFACTORY OF THE WEED SEWING MACHINE COMPANY, HARTFORD, CONN.



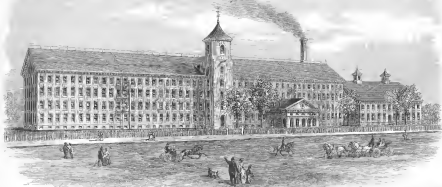
MANUFACTORY OF WM. H. HORSTMANN & SONS, PHILADELPHIA



Wm D. ROGERS & Co
1011 CARRIAGE REPOSITORY 1009

1011 Wm D. ROGERS & Co. Carriage Builders 1009

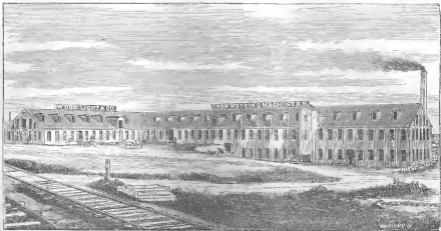
WM. D. ROGERS & CO'S CARRIAGE REPOSITORY, CHESTNUT ST., PHILADELPHIA



MANUFACTORY OF THE WILLIMANTIC LINEN CO., WILLIMANTIC, CONN.



MANUFACTORY OF THE WILSON SEWING MACHINE CO., CLEVELAND, OHIO



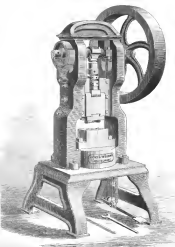
WOOD LIGHT AND COMPANY'S MANUFACTORY WORCESTER, MASS.



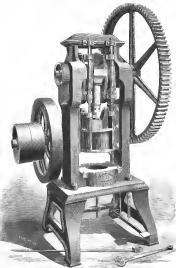
ROHRE'S PATENT PORTABLE FORK.



ANALYTICAL STAND



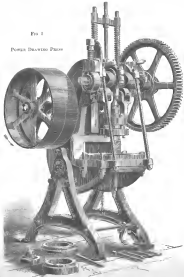
HOIST FORCE. PUMP FOR CONTROL OF WATER



NEW YORK: JAMES W. BROWN, ENGR.

FIG. 1

POWER DRAWING PRESS



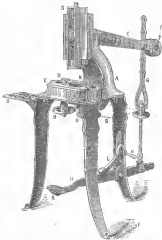
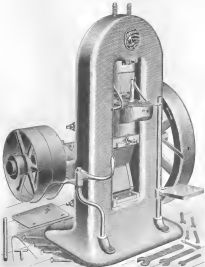


FIG. 1.—Foot Press.



New Cottage Press.

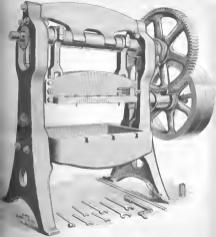
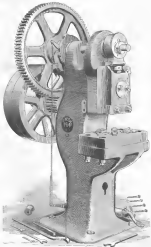


FIG. 10. STEAM ENGINE PARTS.



NEW MODEL PRESS



New Pressure Press



PORTLAND PRESS.



FIG. 17

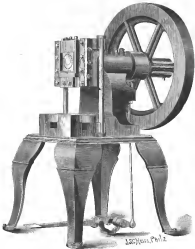


FIG. 1—DIFFERENTIAL VICKERS PRESS

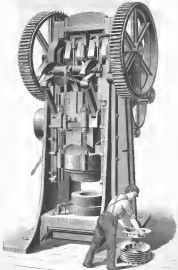
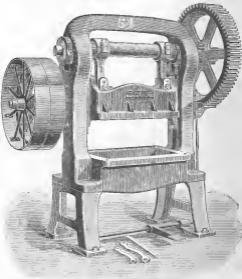
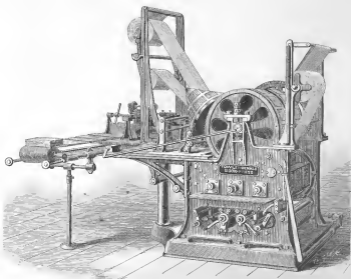


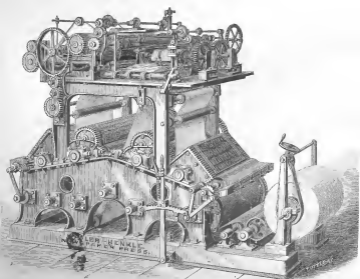
Illustration of a mangle machine, showing the large gears and the worker operating it.



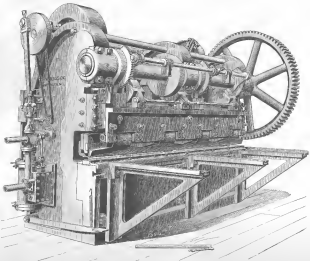




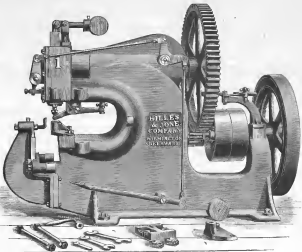
THE FOWLER-HENKLE BOOK PRESS.



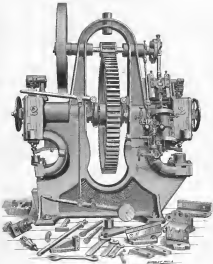
THE FOWLER-HENKLE NEWSPAPER PRESS.



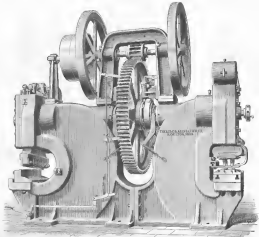
ENGINE DRIVEN GANG PUNCHING MACHINE.



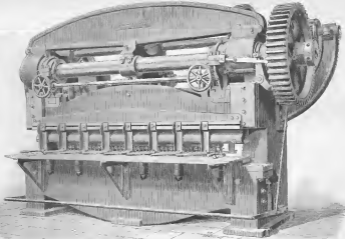
HITLER
& JONES
COMPANY
MADE IN U.S.A.



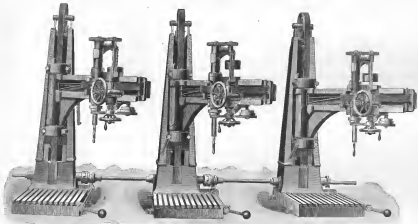
PUNCHES AND DIES AND MACHINERY.



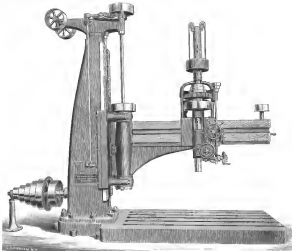
DOUBLE FEED ROLLER AND STRAINER MACHINE



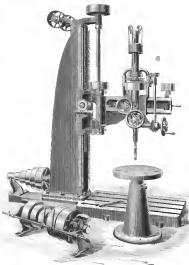
MULTIPLE POWDER MILL



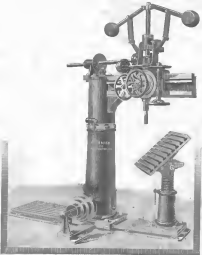
RADIAL DRILLS BY GAYTON



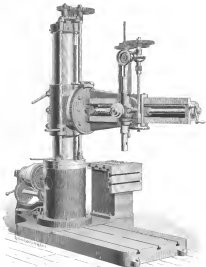
EDISON RENTAL DEPOT, PHOENIX.



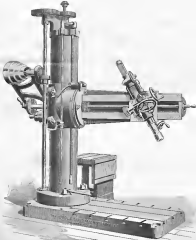
Twenty six Inch Model Drill.



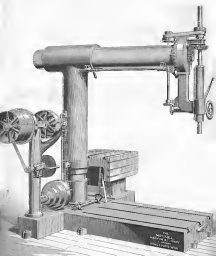
Platform Scale, Patent, 1880



UNIVERSAL RADIAL DRILL.



STEAM ENGINE, HARRIS, 1860



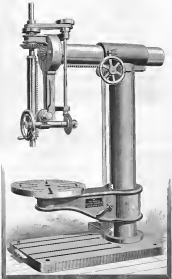
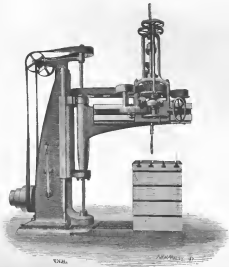
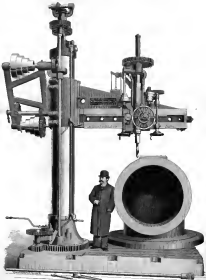


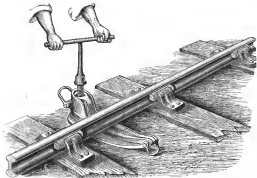
Fig. 1. Scale, Model L. - Part 1.



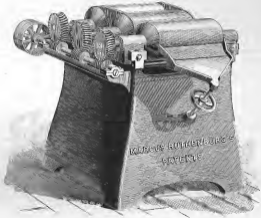
WM. SELLERS & CO.'S RADIAL DRILL.



Large platform scale, New York.



RAIL-LIFTER.



THE HUSTON SELF-LEVELING BERTH.

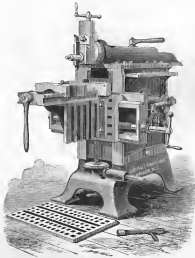
It is no new idea to suspend ship berths so that they will retain an even position at whatever angle the ship may be forced by the waves, and several steamship companies have tried and abandoned such devices. In the *SCIENTIFIC AMERICAN* of May 20, 1880, notice was made of a highly pro-



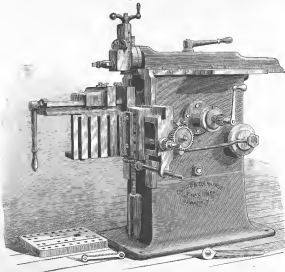
THE HUSTON SELF-LEVELING BERTH.

misg exhibition of the Huston ship's berth on the City of Alexandria, plying between this city and Havana. It is gratifying to know that the opinion which we then formed, with regard to the ability of the invention to overcome the causes of sea-sickness, has been justified by the behavior of the berth under a great variety of conditions at sea.

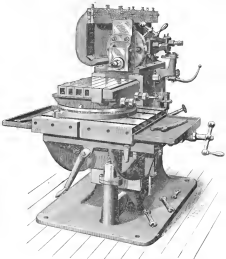
It will be observed from our illustration that the berth (with its occupant) is counterbalanced by a crescent-shaped weight rigidly attached to the underside of the berth, while the whole is so swung on a universal joint as to maintain a level surface no matter how the vessel may pitch and roll. The motion of the berth is also regulated by rubber bands, so that sudden or jerky movements are made impossible. As will be seen in the subjoined cut the berth takes up no more room than the ordinary ship's berth. Even those who never suffer from sea sickness will appreciate the value of a contrivance which enables them to lie at ease in the roughest weather; while to invalids, and to those who are certain to be martyrs to the distressing *mal de mer*, the advantage of being substantially independent of the ship's motion while on board ship is beyond one's power to estimate. Obviously the plan here described can, at the best, prevent sea-sickness only while the patient is lying down. It is very desirable that some one should devise a means of preventing sea-sickness absolutely. A fortune would surely be his reward.



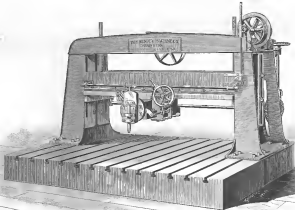
IMPROVED SHAPER MACHINE



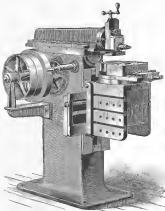
IMPROVED SHAPING MACHINE.



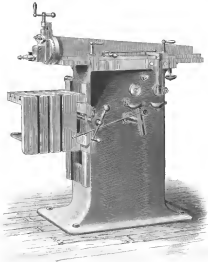
IMPROVED MODEL



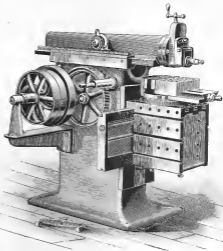
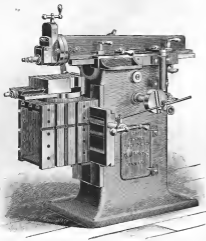
SUSPENSION SHAPER.



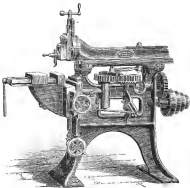
FIFTEEN INCH SCRAPER.—SEE PAGE 4.



NEW 24-INCH BEARER.



TWENTY FOUR-INCH SHAPER.



NEW SEWING MACHINE.

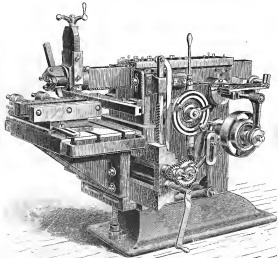
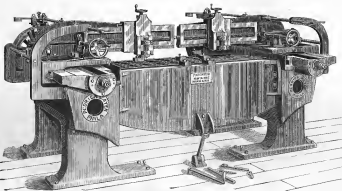


Fig. 58.



DUPLEX PLANING MACHINE.

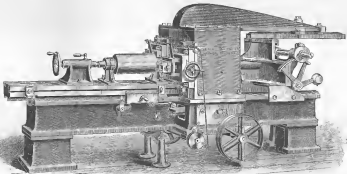
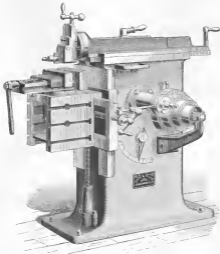
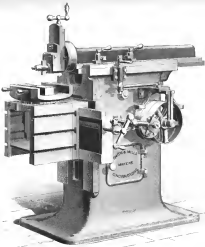


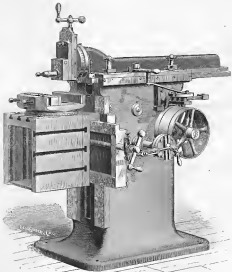
Fig. 77.—ROLL GROOVING MACHINE.



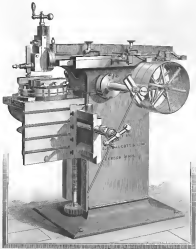
IMPROVED CRANE BRAKE



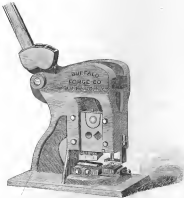
DOUGLASS & CO. SEWING



TWENTY-TON DOUBLE-HEADED SHAPER.



NEW SEALING



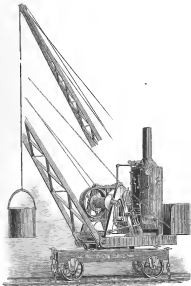
COMBINED PUNCH SHEAR AND BAR CUTTER.



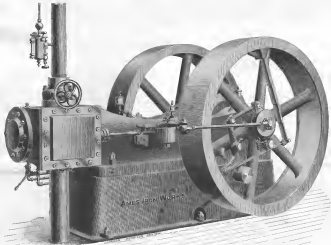
COMBINED SCREW AND ROD CUTTER.

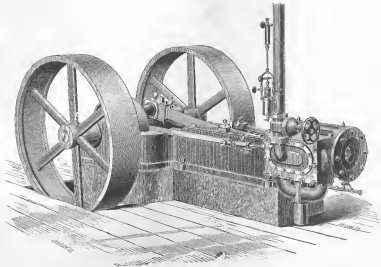


YOUNG'S PATENT PRESS

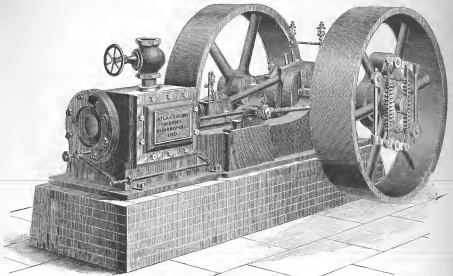


WILLIAMSON BROTHERS' STEAM CRANE.

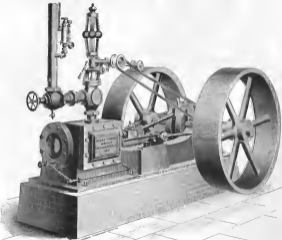




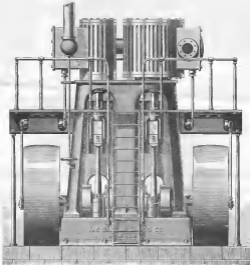
NEW AUTOMATIC CUT-OFF ENGINE.



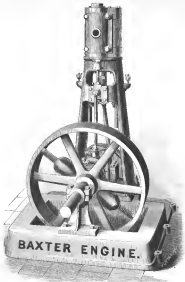
NEW SELF-CONTAINED ENGINE.



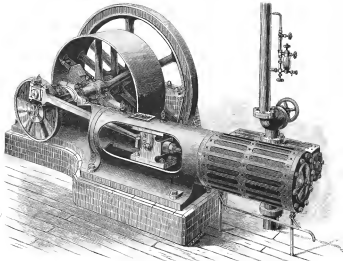
NEW SELF-CONSISTANT ENGINE—See Page 1.



High-pressure Compound Engine

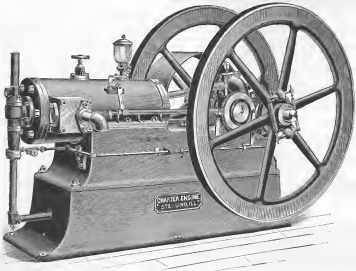


BAXTER ENGINE.

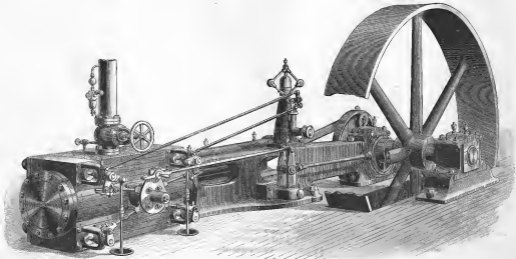


THE BAXTER AUTOMATIC CUT-OFF ENGINE—VERTICAL AND HORIZONTAL TYPES.

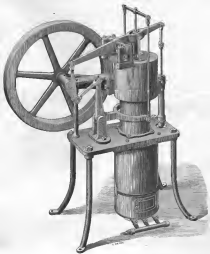




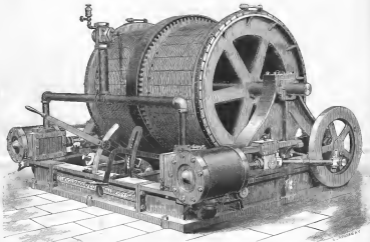
CHARTER GASOLINE ENGINES.



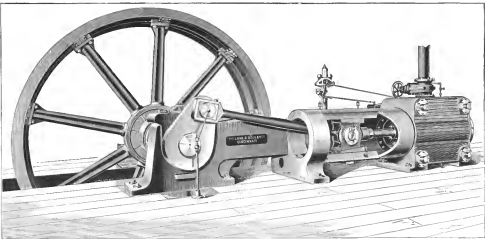
DIMESON-CONDENS ENGINE.



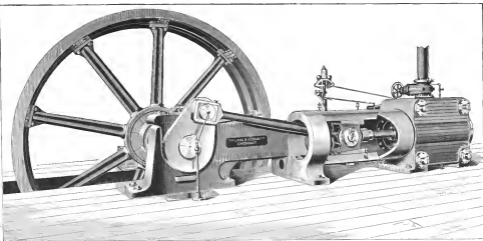
REARSON'S NEW GRABBY PUMPING ENGINE.



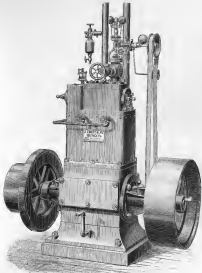
IMPROVED PORTABLE ENGINE.



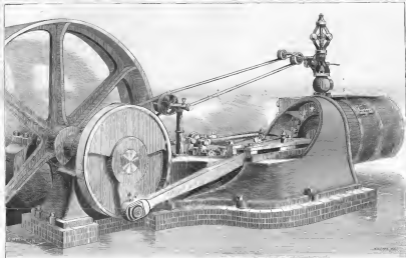
THE LANE & BODLEY "COLUMBIAN" CORLISS ENGINE.



THE LANE & BODLEY "COLUMBIAN" CORLISS ENGINE.



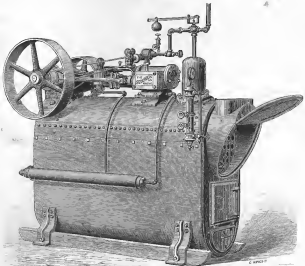
THE METALLIC HIGH SPEED ENGINE.



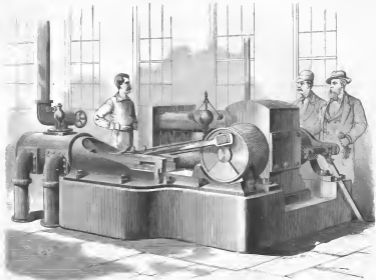
NEW HORIZONTAL STEAM ENGINE.



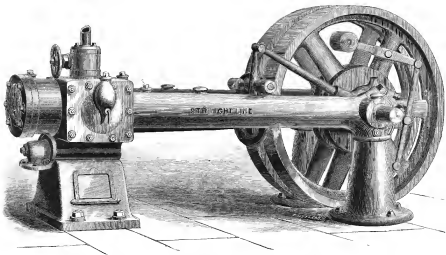
FIVE HORSE POWER VERTICAL ENGINE



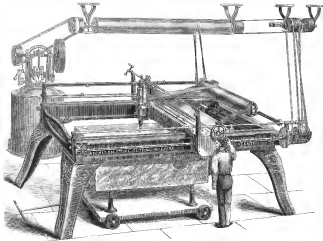
SEDGWICK PORTABLE STEAM ENGINE.



EDISON'S STEAM DYNAMO-ELECTRIC MACHINE.



THE NEW STRAIGHT LINE STEAM ENGINE.



NEW BRONX AND HARTFORD COTTON MACHINES—SEE PAGE 2



FIG. 1.

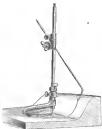


FIG. 2.

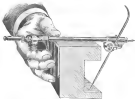
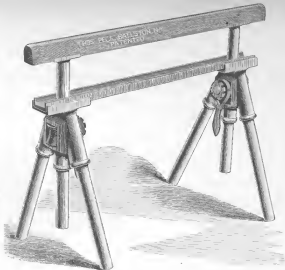


FIG. 3.—ADJUSTABLE SURFACE GAUGE



IMPROVED TRESTLE.



TRICYCLE WITH COPLAND ENGINE.—SEE PAGE 1.

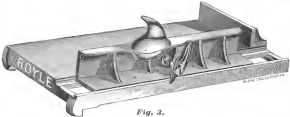
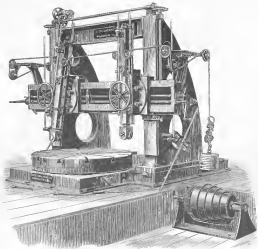
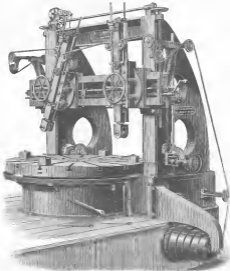


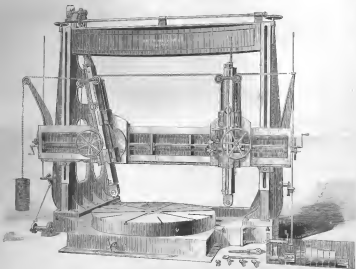
Fig. 3.

Electrotyping Tools.

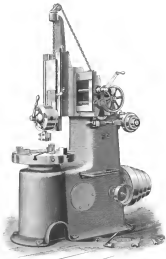




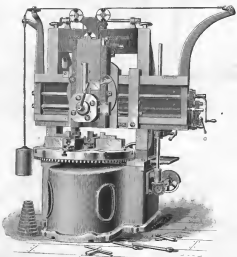
IMPROVED BORING AND TURNING-MILLS



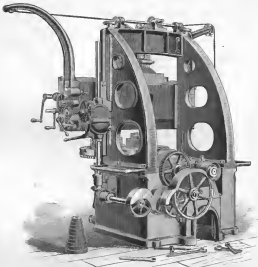
FOOTERS-FOOT BORING AND TURNING MILL.



THIRTY INCH VERTICAL CUTTING AND FACING MACHINES



BORING AND THREADING MILL WITH TURRET HEAD.



BORING AND TURNING MILL WITH TURRET HEAD.—SEE PAGE 1



NEW BORING AND TURNING MILL.

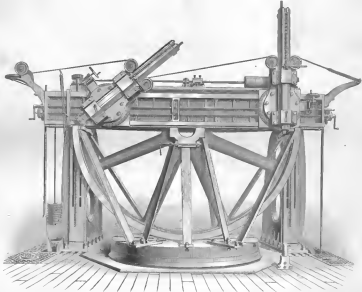
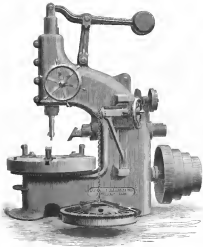


Fig. 1000. — STEAM ENGINE AND TOWER. — See Page 1.



IMPROVED VERTICAL CAR WHEEL BOILER.

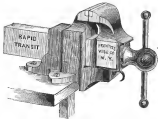
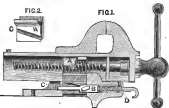
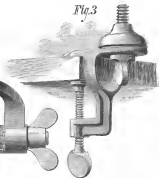
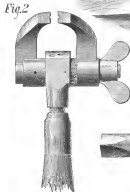
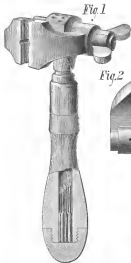


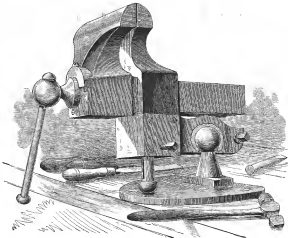
FIG. 3.



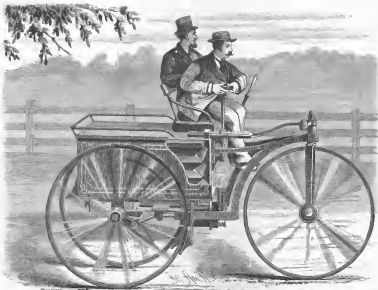
PRENTISS VISE CO.'S "RAPID TRANSIT"



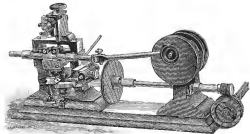
B. F. STEPHENS' SOLID STEEL HAND AND BENCH VISE.



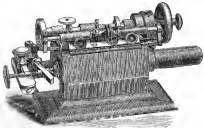
NEW BENCH VISE.



WARRINGTON'S ROAD ENGINE.



AUTOMATIC LEAF POLISHER.



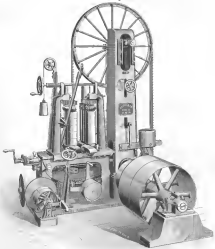
AUTOMATIC STAFF AND PIVOT TURNING MACHINE.



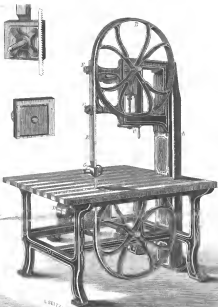
PIUSON CUTTING ENGINE.



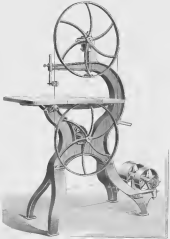
WINDMILL TOWER

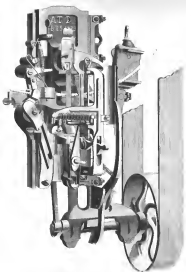


RUBBER MANGLE MACHINE.



FIRST & PAYBELL'S PATENT HAND SAW.





The Horse & Locomotive Works, New York, with various models.

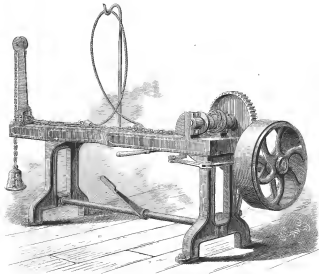
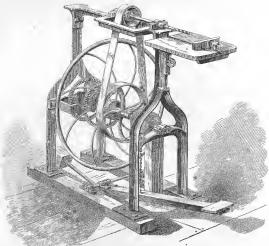
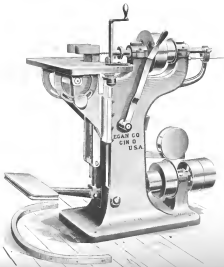


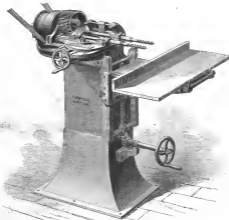
Fig. 4.—POWER WINDLASS FOR TIGHT AND SLACK BARRELS.



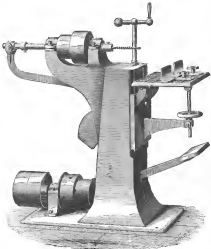
VERTICAL MULTIPLIER BORING MACHINE.



FELLON BORING MACHINE.



ENGLISH SPINDLE REAMER AND BORING MACHINE



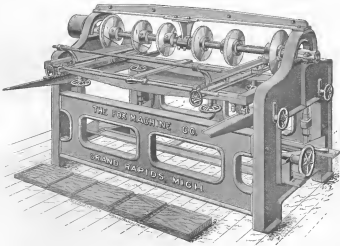
HORIZONTAL BORING MACHINE.



CAST-IRON FOOT POWER MACHINE



BOARD ATTACHMENT OF COLUMBIAN MACHINE



Dado Machine

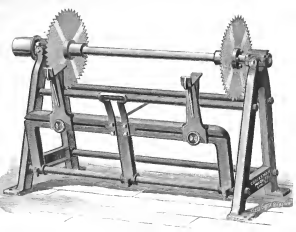


NO BACKWARD MOTION TO DULL THE TOOLS.

For Sale by the Principal Hardware Dealers.

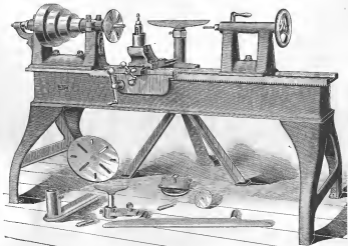
J. H. HOAGUE & CO., Man'fr, CHICOPEE, MASS.



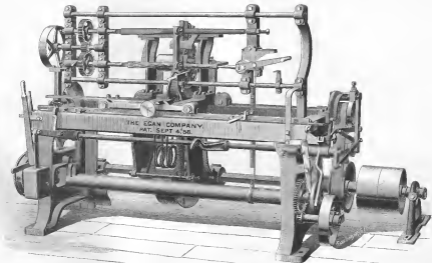




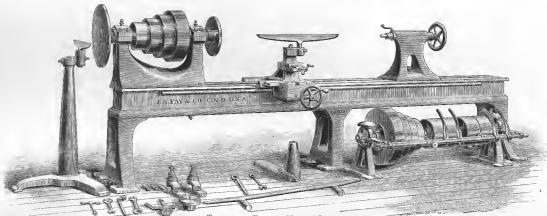
Size Ten Run.



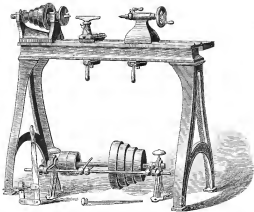
NEW PATTERN MAKERS' LATHE.



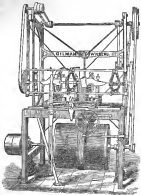
Automatic Spoke Lather



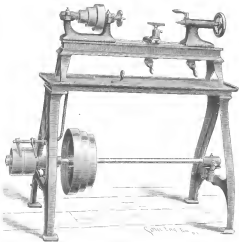
THIRTY-INCH PATTERNS MAKERS' LATHE.



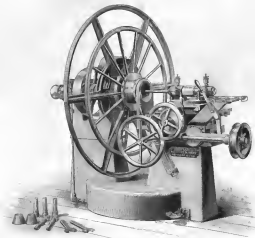
NEW HAND LATHE.



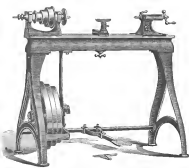
TURNING MACHINE FOR LASTS-



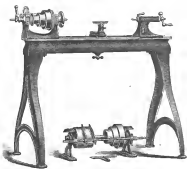
LATHE AND TABLE WITH COUNTERWEIGHT.



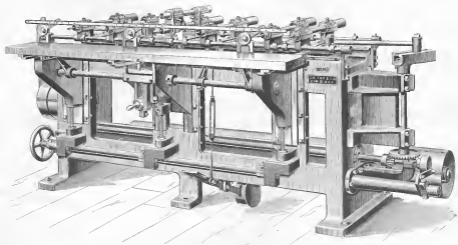
AUTOMATIC WHEEL-HOILING MACHINE



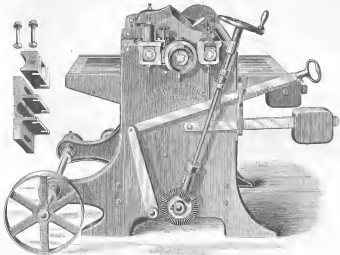
FOOT POWER HAND LATHE.



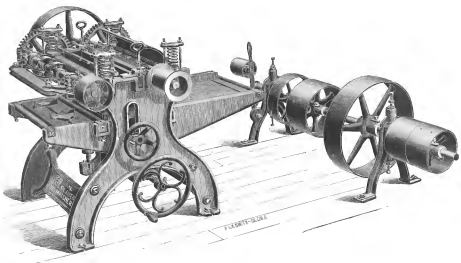
BACK-GEARED HAND LATHE.



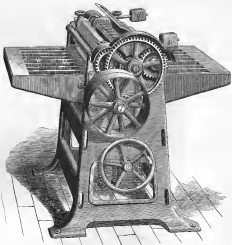
AUTOMATIC MORTISING MACHINE.



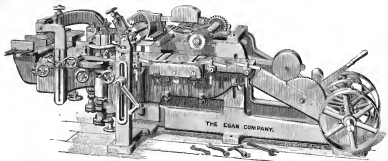
PORT PLAINER AND SMOOTHER.



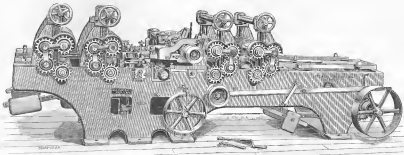
PLASTER AND MATCHER.



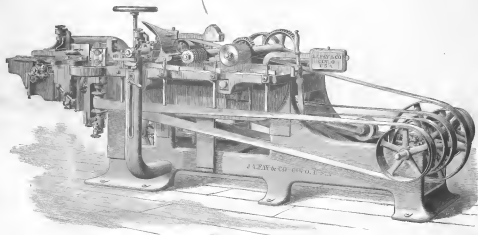
"EUREKA" SURFACE PLANTING MACHINE.



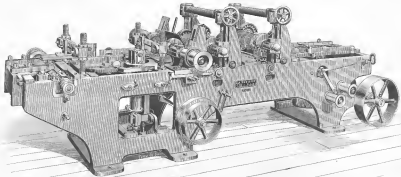
STANDARD MOLDER.



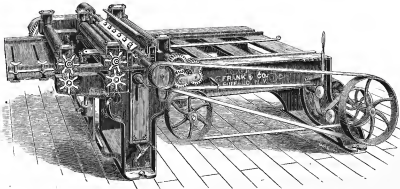
DOUBLE-CYLINDER FLOORING MACHINE.



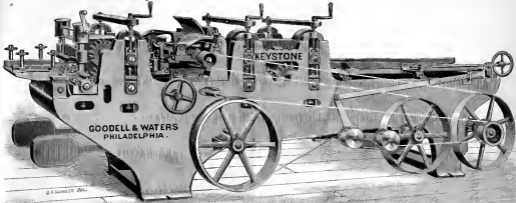
FOUR-SIDE MANGLE MACHINE.



DOUBLE-CYLINDER INSIDE MOLDING MACHINE.



NEW PLASTER AND MATCHER.



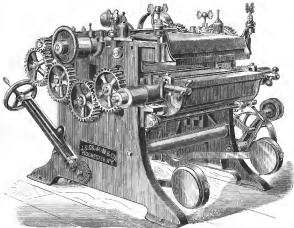
GOODELL & WATERS
PHILADELPHIA.

KEYSTONE

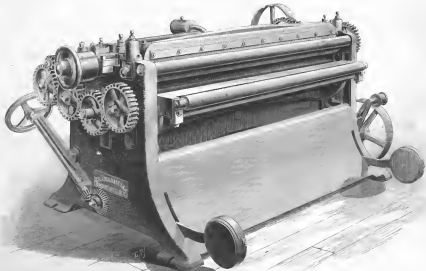
U.S. PATENT OFF.

A. BRADLEY

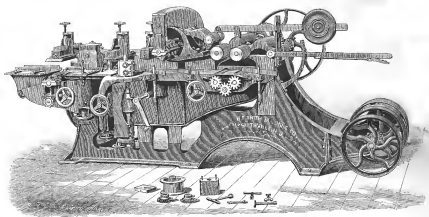
RAPID FEED FLOORING MACHINE.



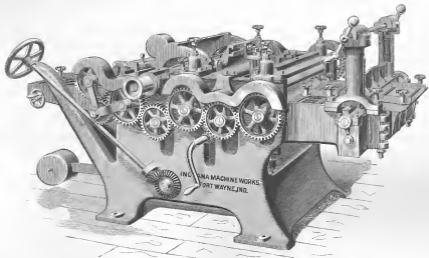
Saw Post Planer.



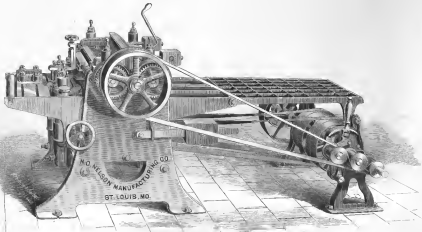
NEW 60-INCH STRAIGHT MACHINE.



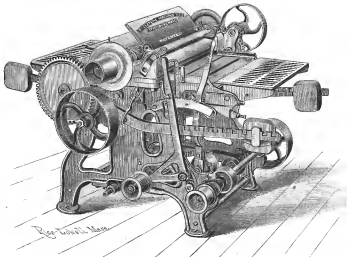
NEW TEN-INCH MOULDING MACHINE



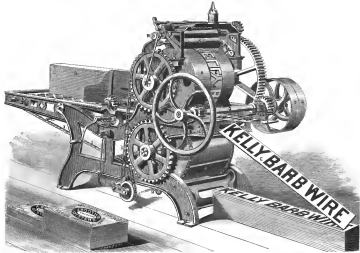
DOUBLE SURFACER, MATCHER AND HOLDER



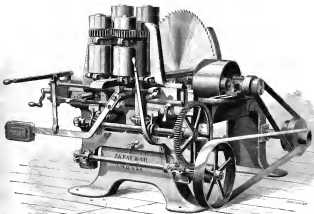
NEW PLANER AND MOLDER



NEW PLANING MACHINE.—(SEE PAGE 2.)



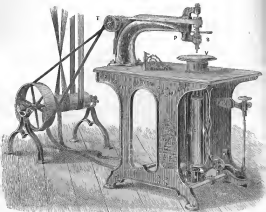
WIRE FACTORY MACHINES



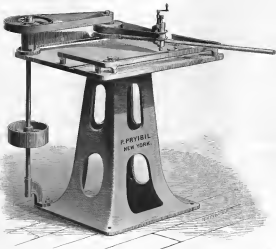
Circular Re-Sawing Machine



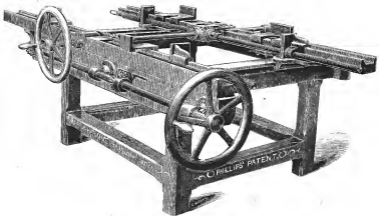
JOHN'S MOLLING MACHINE AS USED FOR SURFACE MOLLING AND PAPERING



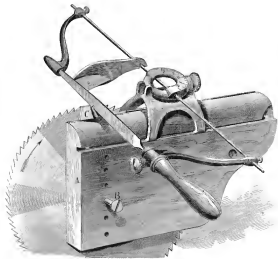
BOYD'S MACHINE AS USED FOR BECKETT HOOLERS, ISLATING, SCOTING, GROOVING, VENERING, &c. &c.



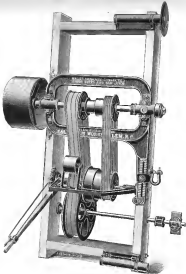
FRY'S NEW BORING MACHINE.



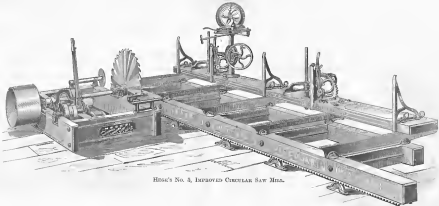
IMPROVED SASH CLAMP.



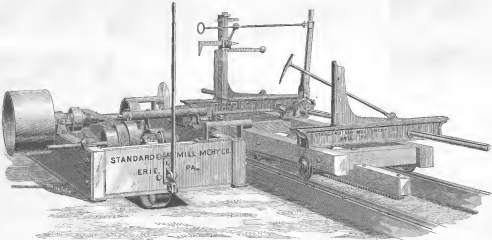
IMPROVED SAW FILE GUIDE



ALFON BOXES AND SAW GUIDE



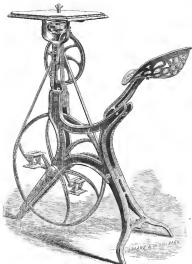
Hess's No. 3, Improved Circular Saw Mill.



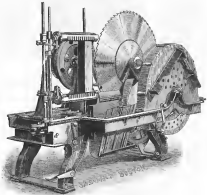
STANDARD SAW-MILL.

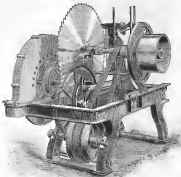


EMPIRE SCHOOL. S.W.



NEW TYPE PORTABLE PUMP.—SEE PAGE 2





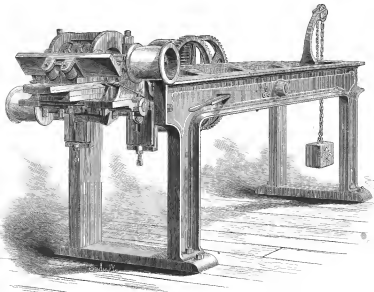


Fig. 1.- MACHINE FOR DRESSING STAVES FOR BEER KEGS BARRELS AND CASES

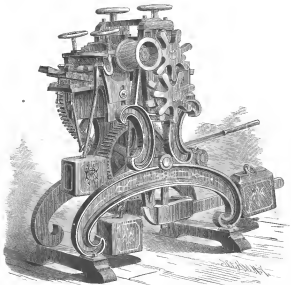


Fig. 2.—MACHINE FOR HOLLOWING STAVES FOR BEER KEGS, BARRELS, AND CASKS

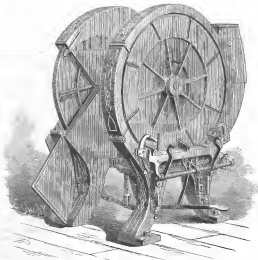
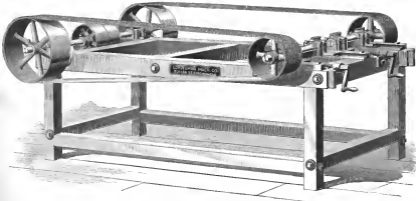
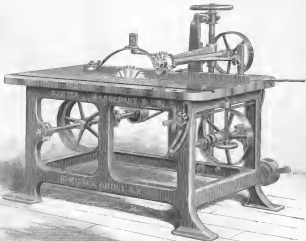


Fig. 3—COMBINED FAN AND STAVE JOINTER.

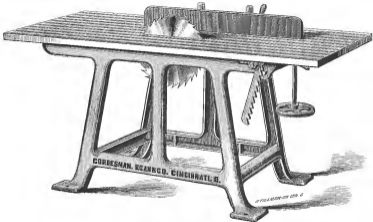


IMPROVED WOOD-WORKING MACHINERY.

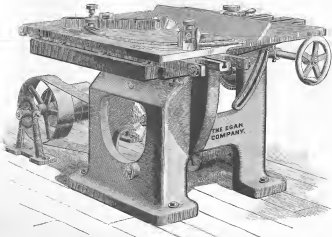


UNIVERSAL SELF-FEED HOT ROLL.

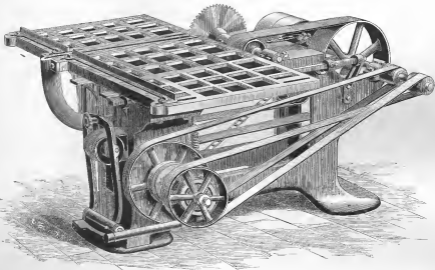




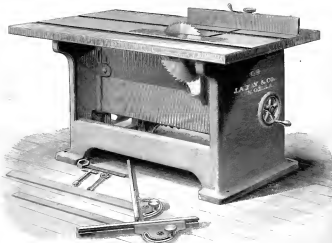
NEW IRON FRAME RIP SAW.



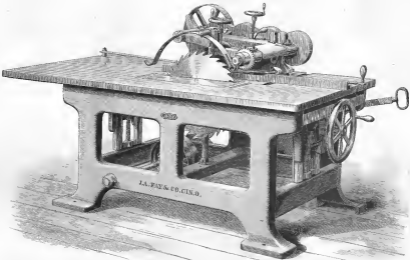
DOUBLE RIP AND CROSS-CUT SAW



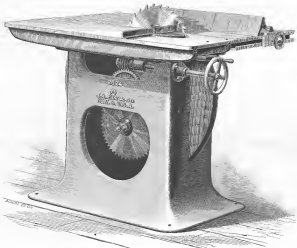
NEW SELF-FEEDING CROSS-CUT SAW.



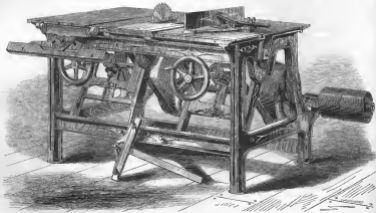
SAW TABLE.



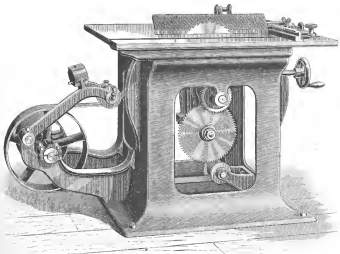
SELF-FEEDING RIP SAW TABLE.



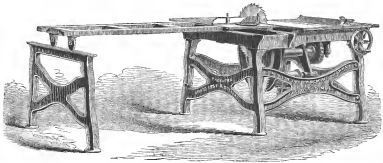
DOUBLE CIRCULAR SAWING MACHINE.



GROSVENOR'S PATENT SAW BENCH.

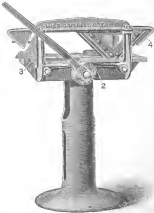


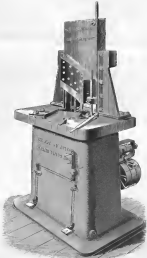
COMBINATION SAW TABLE.



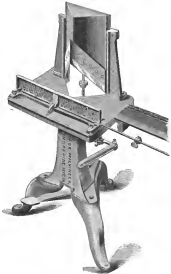
SAW TABLE.



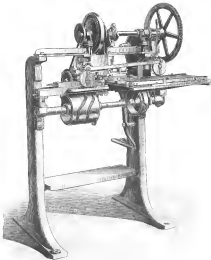




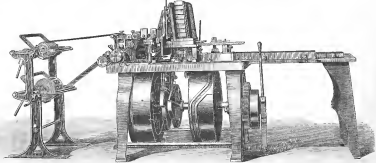
Small Machine Model No. 1000



SPECIAL WIND-POWERED TURBINE



CARBIDE WRAPPING MACHINE



SOAP WRAPPING MACHINE.